

# BULLETIN OF MISCELLANEOUS INFORMATION

No. 6 1939

## ROYAL BOTANIC GARDENS, KEW

### XXXI—SOME NEW ASIATIC BARBERRIES IN CULTIVATION. L. W. A. AHRENDT.

The notes which follow are concerned in every case but one with barberries which are actually in cultivation in England. The genus *Berberis* has suffered in the past very greatly, from the horticultural standpoint, through the distribution of plants under wrong names. I believe that this is in large measure due to the fact that many species of *Berberis* have been described solely from the material available on herbarium sheets, without examination of corresponding living material, or any reference to whether such exists. Thus in the case of the species described by Franchet, it would appear that hardly any were introduced at the time, and the original material has not been sufficient to provide an adequate idea of the species in question. Consequently later introductions were erroneously referred to Franchet's species, while in reality they were quite different. But although these misidentifications were quickly corrected in the literature, the errors still persist in general horticulture. Thus, *B. Veitchii* is still in practice often called *B. acuminata*, and *B. Soulieana* and *B. atrocarpa* are still referred to as *B. levis*. I believe that the same is true of Franchet's *B. sanguinea*, for although I have tried many sources I have failed to get a plant of it. But what is often called *B. sanguinea* seems to be a quite distinct species, and accordingly it has here been given a separate name. Similarly, a common plant in cultivation passes under the name *B. xanthoxylon* Hasskarl, a species which was never described by him\*, and of which the existing herbarium specimens give only a partial idea. But the common cultivated plant is certainly quite different. The true character of this really very distinct *Berberis* has never yet been made clear, and so a full account is here given and a specific name supplied.

Of the species described by Franchet there is one which has escaped the common confusion and is often to be found in gardens: it is *B. pruinosa*, and the living material available at Kew presents two distinct varieties of this, as well as two interesting new species. The other plants here named represent two forms in commercial cultivation which are passing under quite wrong names. As they are quite distinct and cannot be referred to any other species in

\* The name was first validly published by Schneider in 1918 and provided with a full description by Stapf in Bot. Mag. t.9283 (1932); but this description, drawn from a living plant, does not completely agree with authentic Javanese herbarium specimens.

their section, the only practical way of clearing up the confusion is to name them and to supply full descriptions of them, even though their origin is uncertain. The only exception to this principle of examining living plants is in the species called *B. muliensis*. I had hoped to find living material of this, but shall not be able to examine the flowers and fruit until the spring and autumn. But in this case the distinctive characters of the species were very evident from the herbarium specimens.

I should like to express my great appreciation of the facilities which Sir Arthur Hill, the Director of the Royal Botanic Gardens, Kew, has so freely allowed me, particularly in the ability to make full examination of the herbarium specimens; my thanks and gratitude are due also to Mr. A. D. Cotton, Keeper of the Herbarium, and to Mr. W. M. Campbell, Curator of the Gardens, for the kindness with which they and members of their staffs have done all that was possible to help me in collecting the information I needed from dried and living material respectively.

**Berberis** (Sect. **Wallichianae**) **manipurana** Ahrendt, sp. nov.; affinis *B. Hookeri* Lemaire, a qua habitu robustiore altiore, foliis latoribus majoribus subintegris vel subserrulatis vix undulatis, floribus fasciculatis 6–15, sepalorum seriebus solum duobus, petalis haud integris, ovulis tantum 2–5, multum recedit.—*B. Knightii* Hort. non K. Koch. *B. Hookeri* var. *latifolia* Bean, Trees and Shrubs, 1, 243, quoad pl. cult. tantum. *B. xanthoxylon* Schneider in Österr. Bot. Zeitschr. 67, 27 (1918), ex parte, quoad syn. *B. Hookeri* var. *latifolia* et *B. Knightii*, non Hasskarl.

*Frutex* suberectus, ad 3 m. altus. *Ramuli* glabri, leviter angulati, crassi, haud verruculosi, hornotini sufflavi, annotini flavo-brunnei, vetustiores cinerascetes. *Internodia* 2.2–5 cm. longa. *Spinæ* trifidae, validae, 1.5–3 cm. longae, subtus leviter sulcatae. *Folia* subsessilia, elliptica, ovato- vel oblongo-elliptica, apice acuta mucronata, margine subintegra vel (plerumque) parce (10–12 utrinque) remote (3–7 mm. inter se) subadpresse spinuloso- (c. 0.5 mm.) subserrulata, 5–8 cm. longa, 1.5–2.9 cm. lata, supra saturate viridia, nitida, subtus pallide flavo-viridia, subnitida, utraque facie distincte reticulata (nervis supra impressis subtus elevatis), satis tenuiter coriacea, hypodermate nullo (vel indistincto). *Flores* fasciculati 6–12 (–15), 10–14 mm. diametientes. *Pedicelli* satis graciles, 10–18 mm. longi, basi bracteis anguste triangularibus acuminatis c. 4×1.5 mm. suffulti. *Prophylla* ovata, acuta, 3×2.25 mm. *Sepala* exteriora ovata, obtusa, 4.5×3.5 mm., interiora obovata, apice rotundata, 7×5 mm., vel suborbiculata 7×6 mm. *Petala* late obovata, 5×5 mm., apice distincte emarginata, basi glandulis ovatis obtusis 0.8×0.5 mm. praedita. *Ovarium* ovulis (2–) 3–5 subsessilibus instructum. *Baccae* oblongae vel oblongo-ovoideae, 10–10.5×5.5–6 mm. magnae, atro-caeruleae vel atrae, minutissime glauco-pruinosaе, stigmatе sessili. *Semen* 1, 6.5–7×3–3.5 mm.

ASSAM. Manipur, 1882, Watt 6533 (typus in Herb. Kew.), 7206.



In order to understand the position which this plant occupies among the most closely related members of the genus it is necessary to give a brief summary of their history.

In 1819 Wallich discovered a *Berberis* in Nepal which was described in 1824 by De Candolle as *B. Wallichiana*, and which is the first and the type species of this large evergreen section of the genus. It does not seem ever to have been introduced into cultivation, but its nature is well known from the type specimens in the herbarium at Geneva (duplicate at Kew), from De Candolle's original description, and more particularly from a slightly later, and much fuller, description given by Wallich himself.\*

Some time afterwards a very different plant was discovered, by Griffith in Bhutan in 1838† and by Hooker in Sikkim in 1848‡, and this plant was unfortunately referred by Hooker§ to *B. Wallichiana*. Although this error was actually corrected in 1859 when Lemaire|| described the later plant as a new species, *B. Hookeri*, the confusion has persisted down to the present day when plants are still offered for sale under the name *B. Wallichiana*. Such plants are never connected with the original Nepal species but are always forms of *B. Hookeri*.

Now there has been at Kew for many years a plant which was originally called *B. Wallichiana* var. *latifolia*. When it was realized that *B. Wallichiana* was not in cultivation, and that plants so named ought all to be referred to *B. Hookeri*, this principle was extended to the plant just mentioned which was henceforth called *B. Hookeri* var. *latifolia*\*\*. This *Berberis*, although certainly much more closely related to *B. Hookeri* Lem. than to *B. Wallichiana* DC., still shews marked differences on many points even from the former, as the following summary of primary diagnostic characters will indicate :—

(1) *B. Wallichiana* DC.

Shortly stipitate solitary ovule. Many-flowered fascicles (10–20). Short pedicels (6–10 mm.). Flowers of moderate size. Large thick leaves with hypoderm.

(2) *B. Hookeri* Lem.

Ovules 5–8††. Few-flowered fascicles (2–6). Long stout pedicels (1.5–2.8 cm.) Very large flowers (1.3–1.8 cm. diam.) Three series of sepals in addition to the set of outer appressed bracteoles. Entire petals. Fairly small thin leaves without hypoderm. Large fruit.

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\* *Plantae Asiaticae rariores*, 3, 23, t.243 (1832).

† Griffith no. 1740. ‡ Hooker no. 255. § Bot. Mag. t.4656 (1852).

|| L'Illustration Horticole, 6, t.207 (1859).

\*\* W. J. Bean, *Trees and Shrubs hardy in the British Isles*, Vol. 1, p. 243 and Vol. 3, p. 41.

†† In Bot. Mag. t.9153, Stapf has figured *B. Hookeri* as having about three ovules. This plant, however, was derived from an unknown locality, so perhaps it may be a distinct variety. I have examined many cultivated plants of *B. Hookeri* and never found less than five ovules.

(3) The cultivated plant, "*B. Hookeri* var. *latifolia*."

Ovules (2-) 3-5. Medium sized fascicles of flowers (6-15). Slender pedicels of medium length (10-18 mm.). Medium sized flowers (10-14 mm.). Only two series of sepals in addition to the bracteoles. Distinctly emarginate petals. Thin leaves of moderate size without hypoderm.

When we also bear in mind that the leaves of *B. Hookeri* have a rather coarse serration and are only slightly, if at all, reticulate, while those of the *Berberis* under description are, at the most, finely serrulate, but distinctly reticulate, it becomes apparent that the latter is a quite distinct species.

The next point to be mentioned is that this *Berberis* is to be found, not only at Kew under the name *B. Hookeri* var. *latifolia* but also very widely in cultivation and commercial distribution under two other invalid names. These are :—

- (a) *B. Knightii*, a name already preoccupied and used by K. Koch for a S. American species from the Straits of Magellan.\*
- (b) *B. xanthoxylon*, a name for a species from Java, which is similar to *B. Wallichiana* in its very thick large leaves with distinct hypoderm, and large fascicles of 12-20 flowers, but which has no affinity with *B. Hookeri* Lem. and very little with our present plant.

In conclusion two historical facts remain to be mentioned :—

- (A) In 1855, while still referring to the plant which we now know to be *B. Hookeri* as *B. Wallichiana*, Hooker and Thomson† mentioned also a *Berberis Wallichiana* var. *latifolia*. The type of this, *Hooker* no. 40 from Sikkim, which is in the herbarium at Kew, resembles somewhat in its leaves the familiar cultivated plant which I now call *B. manipurana*, but in all its other primary characters seems to belong to *B. Hookeri*, and to be a variety with leaves green, and not pruinose, on the under surface, very close to *B. Hookeri* var. *viridis* Schneider. The name *B. Hookeri* var. *latifolia* must be kept for this form.
- (B) Two specimens collected in Manipur in 1882 are preserved in the herbarium at Kew. They are *Watt* 6533, Ching Sow, N. E. Ranges, 8000 feet, April 1882, labelled *B. Wallichiana* var. *microcarpa*‡, distributed according to a stamp on the label as No. 6428, and *Watt* 7206, Sirvhi furar, 7000 feet, April 1882, labelled *B. Wallichiana* var. *latifolia*.

These two specimens of *Watt* seem to be conspecific with the cultivated shrub incorrectly known as *B. Hookeri* var. *latifolia* or *B. Knightii*. In view of the fact that herbarium specimens of this distinct *Berberis* were distributed as *B. Wallichiana* var. *latifolia*,

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\* K. Koch, *Dendrol*, 1, 413 (1869).

† *Flora Indica*, 226 (1855).

‡ *B. Wallichiana* var. *microcarpa* Hook. f. et Thoms. is an entirely different plant which now holds specific rank as *B. sublevis* W. W. Sm. and to which *Watt* 6428 belongs.



and that subsequently what seems to be an identical plant appeared in cultivation under the same name, there is a possibility that the latter was introduced by Watt. The most satisfactory method of dealing with the existing situation seems to be to make the herbarium specimens of Watt the type of the new species to which the cultivated plants may be referred. The description given has accordingly been based on the herbarium specimens as far as possible, and supplemented as regards the fruit and details of the flowers not clear in these, by the information derived from the living material.

**Berberis** (Sect. **Wallichianae**) **panlanensis** Ahrendt, sp. nov.; affinis *B. sanguineae* Franch., a qua foliis minoribus, floribus solitariis pedicellis brevioribus, ovulis plerumque 3, divergit.

*Frutex* humilis, compactus, dense ramosissimus, 0.3-0.6 m. altus. *Ramuli* hornotini flavo-virides, sulcati, annotini flavo-cincerei, valde sulcati vel subalati. *Internodia* 7-14 mm. longa. *Spinae* trifidae, pallide flavae, subtus subsulcatae, 8-16 mm. longae, basi 0.5-0.7 mm. latae. *Folia* lineari-lanceolata vel lineari-oblonga vel anguste oblongo-elliptica, apice acuta mucronata, basi in petiolum brevissimum breviter contracta, margine subrevoluta parce (utrinque 3-6) remote (2-4 mm. inter se) subadpresse spinuloso- (0.2-0.5 mm.) subserrulata, 10-25 mm. longa et 2-4 mm. lata, supra cinereo-viridia costa media satis impressa, subtus nitida saturate flavo-viridia costa media elevata, utroque latere enervia, satis tenuiter coriacea, hypodermate nullo. *Flores* solitarii, raro 2 fasciculati, 8-10 mm. diametientes. *Pedicelli* 3-5 (-7) mm. longi. *Prophylla* late ovata, acuta, 2-2.5 (-3)  $\times$  1.5-2 (-2.5) mm. *Sepala* exteriora late ovata, obtusa, 4.5-5  $\times$  4 mm., interiora subviridi-lutea, obovato-oblonga, apice rotunda, 5.5-6  $\times$  4.5 mm. *Petala* pallide albo-viridia, obovata, 4.5-5  $\times$  3.5-4 (-4.5) mm., apice subintegra, basi glandulis 0.8-1.2  $\times$  0.5 mm. praedita. *Ovarium* ovulis (2-) 3 sessilibus instructum. *Baccae* ignotae.—*B. sanguinea* var. *microphylla* Hort.

CHINA. W. Szechuan: Pan lan shan, Wilson 2875 (typus in Herb. Kew.).

In the past some confusion has arisen between *B. sanguinea* Franch. and *B. triacanthophora* Fedde. Both have long narrow leaves of a thin texture and without a hypoderm, and a fascicled inflorescence of about two to five flowers. They also have in common ovaries containing generally only two ovules and flowers which are distinctly red on the outside, and this feature is so distinct in the former species that it was the origin of Franchet's specific epithet. Apart from this, however, these two species differ in many ways, as can be seen from the type herbarium specimens and the author's descriptions of them. In *B. sanguinea* the stems are very sharply grooved and yellowish green when young, but in *B. triacanthophora* the new shoots are distinctly red and all the stems more or less terete. As regards the foliage, Franchet's species

has a coarse marginal serration, seven up to seventeen teeth each side, surmounted by long spinules, while the leaves of Fedde's species present a margin which is almost entire and which has, at most, up to five tiny spinules a side. Finally, in *B. sanguinea* the flower pedicels are fairly short, about 6 to 16 mm. long, and never exceeding 2 cm., while in the case of *B. triacanthophora* they are distinctly long, generally 2 to 3 cm.

On June 21st 1908 Wilson collected the plant already referred to, No. 2875, on the Pan lan shan, west of Kuan Hsien, where he found it with "flowers yellow and bronze" and where, he stated, it is rare. Dr. C. K. Schneider has already called attention to the fact that this plant has the yellow sulcate stems of *B. sanguinea*, but leaves much more like those of *B. triacanthophora*, and that it differs from both these species in having three ovules.\* To this must be added the fact that it belongs to that small, and rather distinct, set of species within the section *Wallichianae* which have solitary flowers. All these features point to its being a distinct species. The importance of this conclusion to horticulturists is greatly increased when it is realized that a *Berberis* shewing all these distinguishing features, and consequently botanically identical with the plant just considered, is in cultivation and distribution under the name *B. sanguinea* var. *microphylla*. In the cultivated plant the bracteoles and outer sepals have only the slightest reddish tinge, in contrast to the distinct red colouring of these parts which is an outstanding feature of *B. sanguinea* Franch., and the general appearance of the solitary flowers of "*B. sanguinea* var. *microphylla*" is a very pale greenish yellow due to the inner sepals and petals. Thus we have one further, and by no means unimportant, distinction between *B. panlanensis* and *B. sanguinea*.

As a garden plant I think that this is a particularly ornamental species on account of its very graceful evergreen foliage, and its very compact habit should make it a useful shrub even in quite small gardens.

***Berberis* (Sect. *Wallichianae*) *pruinosa* Franch. var. *barresiana* Ahrendt, var. nov. ; a typo foliis subtus viridibus, floribus tantum 3-6 fasciculatis, petalis integris, fructibus brevioribus, recedit.**

*Frutex* satis erectus. *Ramuli* teretes, hornotini sufflavi, annotini pallide lutei. *Internodia* 2.5-8 cm. longa. *Spinæ* trifidae, validae (basi 1.5-2 mm. latae), 2-3.5 cm. longae, flavae, subtus planae. *Folia* elliptica (vel interdum leviter ovato- vel obovato-elliptica) 2.8-6.2 cm. longa, 1.2-2.5 cm. lata (vel ad 6×1.4 cm.), margine parce (utrinque 5-7) remote (5-8 mm. inter se) spinoso- (0.8-1.5 mm.) serrata, supra cinereo-viridia, subnitida, subnervia, venis lateralibus leviter visibilibus, subtus flavo-viridia, haud nitida, venis lateralibus leviter elevatis, crasse satis rigide coriacea,

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\* Sargent, *Plantae Wilsonianae*, 1, 359 (1913).



hypodermate distincto. *Flores* 6–8 fasciculati, 7–8 mm. diametientes. *Pedicelli* graciles, 10–17 mm. longi. *Prophylla* ovata, acuta,  $2.25 \times 1.5$  mm. *Sepala* exteriora obovata, c.  $3.5 \times 2$  mm., interiora late obovata vel suborbiculata, valde concava, c.  $5 \times 4$  mm. *Petala* obovata,  $5 \times 2.5$  mm., apice obtusa integra, basi unguiculata, glandulis 2 anguste ovatis acuminatis  $1.5 \times 0.5$  mm. praedita. *Stamina* 4 mm. longa, filamentis validis, apice viz producta. *Ovarium* ovulis 2–3 sessilibus instructum. *Baccae* breviter ovoideae,  $5.6 \times 4$  mm., albo-pruinosa, stigmate sessili.

“ No. 4775 MV, Barres, 156–32 ” (typus in Herb. Kew.).

This description was drawn up directly from the living plant at Kew labelled as above. The plant looks fairly like a normal shrub of *B. pruinosa* except that the leaves are more finely toothed. At the appropriate seasons, however, it can be seen to be distinctly different in its few-flowered inflorescence and shorter broader fruit, and also in the fact that its new shoots lack the distinct purple colouring which is generally to be seen for a short while in the very young shoots of *B. pruinosa* before they ripen quickly to their normal yellow shade. More interesting is the contrast between the entire petals of this plant and the deeply incised ones of *B. pruinosa*, a distinction which gives rise to the question whether this may not be a species separate from, even though closely allied to, *B. pruinosa*. As the origin of this plant is unknown it seems best to leave it, for the moment, as a variety, from which it can, if necessary, be raised to specific rank at a later date. The view that it is only a variety is supported by the existence of the following form, which, in some of its characters, is intermediate.

***Berberis pruinosa* Franch. var. *brevifolia* Ahrendt, var. nov. ;** a typo spinis debilibus, foliis brevioribus subtus viridibus, floribus tantum 5–9 fasciculatis, fructibus pedicellisque brevioribus recedit.

*Frutex* satis erectus. *Ramuli* teretes, glabri, hornotini sufflavi, annotini pallide lutei. *Internodia* 2–3 cm. longa. *Spinae* debiles, simplices vel 3-fidae, 5–8 mm. longae, subtus planae. *Folia* obovata (vel obovato- vel elliptico-oblonga),  $1.6-3.2$  ( $-4.5$ ) cm. longa,  $0.8-1.5$  ( $-2$ ) cm. lata, margine parce (utrinque 2–7) remote ( $4-8$  mm. inter se) spinoso-(c. 1 mm.) serrata, supra cinereo-viridia, vix nitida, subnervia, venis lateralibus vix visibilibus, subtus flavo-viridia, subnitida, venis paucis lateralibus subelevatis, crasse satis rigide coriacea, hypodermate distincto. *Flores* 6–7 mm. diametientes, 5–9 fasciculati. *Pedicelli* 6–10 mm. longi. *Prophylla* ovata, acuta,  $2 \times 1.5$  mm. *Sepala* plus minusve ut in *B. pruinosa* var. *barresiana*. *Petala* obovata,  $4.5 \times 3-3.5$  mm., apice distincte incisa, basi breviter unguiculata, glandulis 2 anguste ovatis sub-acuminatis c.  $1.2 \times 0.4$  mm. praedita. *Stamina*  $3.5-4$  mm. longa, apice obtusa haud producta. *Ovarium* ovulis 3 subsessilibus instructum. *Baccae* estylosae, breviter ovoideae,  $5.5-6 \times 3.5-4$  mm., albo-pruinosa.

" No. 145, U.C.B.G. ; 32/1042R ; 1053/32 Goodspeed " (typus in Herb. Kew.).

The description was drawn up directly from the living plant at Kew labelled as above. This variety, while sharing with the previous one the noticeably small clusters of flowers and shorter and broader fruit, is like the type in its deeply incised petals. However, it can scarcely be said to lie completely between the two for it differs from both in its short pedicels and leaves.

**Berberis** (Sect. **Angulosae**) **muliensis** *Ahrendt*, sp. nov. ; affinis *B. dictyophyllae* Franch., a qua ramulis sulcatis, pedicellis longioribus, fructibus multo majoribus stylis haud praeditis, foliis angustioribus divergit.

*Frutex* 1-1.5 m. altus. *Ramuli* sulcati, glabri, hornotini rubri epruinosi, annotini atro-rubri vel rubro-fusci. *Spinae* nunc absentes nunc trifidae validae, subtus planae, 2-3.3 cm. longae. *Internodia* 2-5 cm. longa. *Folia* anguste obovata, apice obtusa, basi cuneata in petiolum 2-3 mm. longum contracta, margine integra (raro utrinque 1-2-spinulosa), utraque facie reticulata, 1.5-3 (-4.5) cm. longa, 3-7 (-11) mm. lata, supra viridia, subtus cinereo-viridia. *Flores* solitarii (interdum 2 fasciculati), 16-19 mm. diametientes. *Pedicelli* validi (1-) 1.5-3 cm. longi. *Prophylla* late ovata, acuta, 2.5×2.5 mm. *Sepala* exteriora ovata, subacuta, c. 7×4 mm., interiora obovata, apice rotundata, 8-10×6-7 mm. *Petala* late obovata, 6-6.5×5-5.5 mm., apice breviter emarginata, basi glandulis elongatis anguste ellipticis utrinque acutis 1×0.2 mm. praedita. *Stamina* 4.5-5 mm. longa, apice distincte producta apiculata. *Ovarium* ovulis c. 3 instructum. *Baccae* anguste ovoideae vel oblongo-ovoidae, 14-17×6-9 mm., stigmatibus sessili. *Semina* 2-3.

CHINA. S. W. Szechuan: Mu-li Mts., open alpine meadows, 3300-3600 m., 1921, *Forrest* 20431 (fl.), 20633 (fr. ; typus in Herb. Kew.).

*B. dictyophylla* Franch., according to the herbarium specimens collected by Delavay, has berries which measure about 9×6 mm. and possess a very short style. In other, and later, specimens which have been referred to this species, the style is distinctly longer. *B. muliensis* differs primarily from this species of Franchet in its very much larger fruit and complete lack of style. The other differences mentioned above are very noticeable in the two type specimens quoted but may be of secondary diagnostic importance for the following reasons :

(1) There seems to be a form of *B. muliensis* with somewhat shorter pedicels. This is represented by *Forrest* 20350, a fruiting specimen from S. E. Tibet, Tsarong, also of 1921, which differs only in having pedicels restricted to 10-15 mm. in length. It seems quite likely too that this form includes a flowering specimen, *Forrest* 16448, from N. W. Yunnan, Mu-li Mts., but, as there is no fruiting companion to this, one cannot be quite certain. This



last specimen of Forrest's has been referred to *B. yunnanensis*,\* but this can hardly be so. It is true that *B. yunnanensis* Franch. also possesses red stems which have no bloom, and estylose berries, but these are very much smaller, and the form of the inflorescence is quite different, having from three to eight flowers in a somewhat elongated pseudo-umbellate or subracemose arrangement, with very long pedicels comparable with those described above.

(2) There exist also specimens which appear to belong to this species but which have broader leaves with a toothed margin. These seem sufficiently distinct to have a varietal name :

***Berberis muliensis* var. *atuntzeana* Ahrendt**, var. nov.; a typo foliis serrulatis latioribusque recedit.

*Folia* obovata, apice rotundata, basi breviter contracta, sessilia, 2.5-3×1-1.5 cm., margine parce (utrinque 3-7-) spinuloso-serrata. *Pedicelli* 2-4.5 cm. longi.

CHINA. Yunnan: E. of Atuntze, fr. Sept. 1921, *Forrest* 20713 (typus in Herb. Kew.).

To this variety the following specimen also probably belongs, but on the herbarium sheet at Kew its very long pedicels alone remain, without either flowers or fruit—S. E. TIBET: Tsarong, fl., 1921, *Forrest* 20264.

There seems to be yet another form lying between this variety (which it resembles in its spinulose leaves) and the type (to which it has similar narrow foliage) :

***Berberis muliensis* var. *beimanica* Ahrendt**, var. nov.; a typo foliis distincte serrulatis recedit.

*Folia* oblongo-oblancheolata, 2-3 cm.×4-6 mm., parce (utrinque 5-7) remote (2-5 mm. inter se) spinoso-subserulata, satis anguste reticulata. *Pedicelli* validi, 14-22 mm. longi.

CHINA. N. W. Yunnan: Bei-ma-shan, fr., 1921, *Forrest* 21002 (typus in Herb. Kew.).

This specimen, according to the field notes attached to the herbarium sheet, has scarlet-crimson fruit and grows only 2-3 feet high on ledges and cliffs on the stony slopes of its habitat. *Forrest* 20264 is described as having flowers with an orange ruddy exterior.

Although the specimens listed under *B. muliensis* and its varieties come from Szechuan, Yunnan and Tibet, it should be noted that actually a comparatively small area is concerned where the boundary between the extreme north-west of Yunnan and the most south-westerly portion of Szechuan meets the Tibetan-Chinese frontier.

***Berberis lepidifolia* Ahrendt**, sp. nov.; affinis *B. Poirerii* Schneid., a qua foliis angustioribus, pedicellis longioribus, bracteis brevioribus, baccis atro-caeruleis stylosis multo recedit.

*Frutex* satis erectus, ad 2 m. altus. *Ramuli* sulcati, glabri, annotini pallide virides, interdum paullum rubescentes, annotini

\* Notes from the Royal Botanic Garden, Edinburgh, Vol. 17, 200, March 1930.

brunnei. *Internodia* 8–20 mm. longa. *Spinae* solitariae, plerumque debiles, 3–6 mm. longae, interdum basi ramulorum 1–2 cm. longae, saepe absentes. *Folia* decidua, lineari-oblancoolata, basi sensim cuneata, sessilia, apice breviter acuta, mucronulata, margine integra revoluta, 1.7 cm.  $\times$  1.5–2 mm. usque 4.5 cm.  $\times$  4–5 mm., supra viridia, costa media satis impressa nervis lateralibus paucis visibilibus, subtus papillosa, leviter cinereo-pruinosa, nervis lateralibus pauculis. *Inflorescentiae* 5–12-florae, umbellatae vel subumbellatae, interdum pseudo-umbellatae laxae subracemosae, 2–4.5 cm. longae. *Pedunculi* graciles, 1.2–3 cm. longi, medio bracteis lanceolatis acuminatis 1.5  $\times$  0.7 mm. suffulti. *Pedicelli* (5–) 7–10 mm. longi, basi bracteis ovatis 1  $\times$  0.6 mm. apice acuminatis suffulti. *Sepala* 3, ovata, apice obtusa vel subacuta, 2–2.5  $\times$  1.3–1.5 mm., margine flava, medio rubra. *Petala* oblongo-elliptica, 2.5  $\times$  1.3 mm., apice emarginata biapiculata, basi haud unguiculata, glandulis 2 ellipticis vel ovato-ellipticis obtusis 0.5  $\times$  0.2 mm. praedita. *Stamina* 1.8 mm. longa. *Ovarium* ovulis 2 breviter stipitatis instructum. *Baccae* ovoideae, 5.5–6  $\times$  4.5–5 mm., atro-caeruleae, leviter glauco-pruinosae, stylo brevissimo sed distincto. *Semen* solitarium, 4  $\times$  1.9 mm.

CHINA. Yunnan: Chien-Chuan-Mekong divide, 3300 m., Aug. 1923, *Forrest* 23614 (typus in Herb. Kew.).

This very attractive species, of which there is a fairly full grown specimen at Kew, is unusual on account of its blue black fruit (not often to be found combined with deciduous foliage, in cultivation) and very ornamental because of its slender and graceful leaves. There is in the Herbarium a sterile specimen which looks as if it would be identical with this plant, although in the absence of both flowers and fruit it is not possible to be quite certain. I refer to *Forrest* 22051, "B. sp. aff. *Poiretii*, 4–5 feet, sparingly spinous; open rocky hillsides and amongst scrub on mountains between Yung-peh and Yung-ning, S. W. Szechuan, July-August, 1922, 10,000 feet." The type collection is described in the Field Notes as "shrubs, 3–4 feet, fruits black purple, on ledges of cliffs and stony slopes in side valleys."

The fine and almost fully grown specimen of *B. lepidifolia* is to be found in the Berberis Collection in the gardens close to the lily pond.

**Berberis** (Sect. **Angulosae**) **validisepala** *Ahrendt*, sp. nov.; affinis *B. angulosae* Wall., a qua ramulis glabris, fructibus minoribus, ovario ovulis tantum 2–4 instructo multum recedit.

*Frutex*; ramuli plus minusve sulcati, glabri, annotini brunnei. *Internodia* 1.5–3.5 cm. longa. *Spinae* trifidae, 1–1.4 cm. longae, subtus planae. *Folia* obovata, apice rotunda mucronulata, basi in petiolum 2–7 mm. longum contracta, margine integra (raro parce, utrinque 1–2-spinulosa), 1–3 cm. longa et 0.4–1 cm. lata, superne viridia nervis lateralibus paullo prominulis, subtus albo-pruinosa reticulata. *Inflorescentiae* fasciculatae, (1–) 2–5-florae.



*Flores* 1.3–1.6 cm. diametientes. *Pedicelli* glabri, validi, 12–18 mm. longi, basi bracteis triangularibus  $1.7 \times 1$  mm. suffulti. *Inflorescentiae* raro umbellatae, 2–3-florae, pedunculo nudo 4–8 mm. longo, pedicellis 7–10 mm. longis. *Prophylla* saepe nulla, interdum oblongo-ovata, acuta,  $3.8 \times 1.8$  mm. *Sepala* rigida, exteriora 3 obovata, apice rotunda vel obtusa,  $7.8 \times 4.5$ –5 mm., interiora 3 obovata, apice rotunda,  $8.5 \times 5.5$  mm. *Petala* obovata,  $7.8 \times 4.5$  mm., apice breviter emarginata, biapiculata, basi cuneata, haud unguiculata, glandulis separatis late ellipticis ( $0.7$ – $0.8 \times 0.5$ – $0.6$  mm.) praedita. *Stamina* c. 3.7 mm. longa, apice distincte producta, apiculata vel subobtusa. *Ovarium* ovulis 2–4 instructum. *Baccae* late ellipsoideae,  $8.9 \times 6.5$ – $7.5$  mm., rubrae, stigmate sessili vel subsessili. *Semina* 1–3,  $5.5$ – $6 \times 3.5$ –4 mm., vel  $6 \times 2.5$  mm.

*Typus*: “No. 152” in Herb. Kew.

This interesting species was described with the aid of living material of the plant from which the herbarium specimen was taken. This species has also an affinity with *B. yunnanensis* Franch. in the number of its ovules and in its estylose fruit, but its berries are much broader and more globose, and it is easily distinguished, too, on account of the non-racemose inflorescence and the distinctly white undersurface to the leaves.

**Berberis** (Sect. **Angulosae**) **suberecta** Ahrendt, sp. nov.; affinis *B. rubrostillae* Chittenden, a qua fructibus brevioribus latioribusque, floribus minoribus, sepalorum seriebus tantum duobus, petalis haud integris, ovulis pluribus, foliis amplioribus multum recedit.—*B. Giralddii* Hort. non Hesse. *B. rubrostilla* forma *erecta* Hort.

*Frutex* suberectus. *Ramuli* sulcati, glabri, hornotini flavo-virides, annotini rubro-fusci, vetustiores cinerascens. *Internodia* 1.4–2.2 (–2.7) cm. longa. *Spinae* sufflavae, subtus subtiliter sulcatae, 1.5–2.3 (–2.8) cm. longae. *Folia* obovato-elliptica, elliptica, vel elliptico-oblonga, apice obtusa vel rotunda, basi cuneata et in petiolum brevissimum (1–5 mm. longum) attenuata, margine parce (utrinque 3–7) remote (2.5–4 mm. inter se) aristato- (1–2 mm.) dentata (0.5–1 mm.),  $1.2$ – $3 \times 0.7$ – $1.4$  cm., vel usque  $3.2 \times 1.2$  cm. (surculorum  $2.3 \times 1.5$  cm.), supra haud nitida, saturate viridia, indistincte nervata, subtus leviter pruinosa, leviter papillosa, pallide canescentia. *Inflorescentiae* 2–3 (–4) cm. longae (pedunculo nudo (2–) 6–10 mm. incluso), (3–) 5–6 (–8)-florae, umbellatae vel pseudo-umbellato-subracemosae, raro fasciculatae. *Flores* 10–12 mm. diametientes. *Pedicelli* (4–) 6–10 mm. longi, basi bracteis rubescentibus late triangularibus ( $1.1 \times 0.9$  mm.) suffulti. *Prophylla* ovata, subacuta,  $2.3 \times 1.1$ – $1.5$  (–2) mm. *Sepala* exteriora ovata vel elliptico-oblonga, obtusa,  $5.6$ – $5 \times 2.5$ – $3.5$  mm., interiora obovata vel elliptico-oblonga, apice rotunda,  $6.7 \times 3.5$  mm. *Petala* obovata,  $4 \times 2.5$ –3 mm., apice emarginata et biapiculata, basi breviter unguiculata, glandulis oblongo-orbiculatis ( $0.4 \times 0.35$ – $0.4$  mm.) praedita. *Stamina* normalia apice haud producta. *Ovarium* ovulis

5-8 subsessilibus instructum. *Baccae* oblongo-ovoideae, saturate rubro-roseae, 10-12×7-8 mm., stigmatе subsessili.

Origin unknown; typus in Herb. Kew.

This plant has been cultivated and distributed for some time under the name *B. Giralddii*. The true plant of this name as described by Hesse belongs to the section *Brachypodae* and has very large leaves and an elongated spike-like inflorescence and has only recently become available for purchase in this country. When it became known that the plant which had been previously sold as *B. Giralddii* was entirely different, and belonged to the Section *Angulosae*, it was referred to as the upright form of *B. rubrostilla*. This name is certainly appropriate in many ways, for the two plants are alike in certain outward characters, and are both of outstanding ornamental value. The new plant can easily be distinguished by its shorter and broader fruit, its broader leaves and more erect habit. When the important botanical differences mentioned above are taken into account it will be seen to be specifically distinct, not only from *B. rubrostilla* Chittenden, but from all the other members of its section.

**Berberis** (Sect. *Angulosae*) *diantha* Ahrendt, sp. nov.; affinis *B. concinnae* Hook. f. et Thoms., sed floribus duobus pedunculatis, ovario ovulis 4-6 instructo, fructibus stylis praeditis distincta.

*Frutex* humilis, compactus. *Ramuli* angulati et leviter sulcati, glabri, hornotini flavescentes, annotini subnitidi, atro-rubri. *Internodia* 10-20 mm. longa. *Spinae* trifidae, satis validae, subtus sulcatae, 1.5-2.5 cm. longae. *Folia* obovata, 1-2.2 cm. longa et 0.5-1.2 cm. lata, apice rotunda, aristata, basi cuneata, margine parce (utrinque 2-3) remote (3-4 mm. inter se) aristato- (2.3 mm.) dentata (1-2 mm.), supra opace cinereo-viridia, subtus albo-pruinosa, utraque facie subtiliter nervata, haud reticulata, subchartacea. *Inflorescentiae* umbellatae, biflorae (raro triflorae), floribus 9-12 mm. diametientibus, pedunculis pedicellisque 1.2-2 cm. longis. *Prophylla* flava, ovata, c. 2 mm. longa. *Sepala* exteriora ovata vel elliptica, subacuta, 5.5-7×2.5-3.5 mm., interiora late elliptica vel oblongo-obovata, 7-9×5-6 mm. *Petala* anguste obovata, 5-6×2.5-3 mm., apice rotunda integra, basi glandulis ellipticis 0.5-0.6×0.3 mm. praedita. *Stamina* 4 mm. longa, apice leviter producta apiculata. *Ovarium* ovulis 4-6 instructum. *Baccae* anguste oblongae vel oblongo-ellipsoideae, 13-15×4-5 mm., distincte stylosae.

Origin unknown; typus in Herb. Kew.

This shrub is very like *B. concinna* in habit, in its long and narrow fruit, and in its fairly broad small leaves with a conspicuously white undersurface. The leaves differ from those of *B. concinna* only slightly, in having a more gradually cuneate base and fewer marginal teeth. In certain other characters of greater botanical importance it is quite distinct and deserves specific rank. These are the distinctly stylose fruit (rather smaller in size), the ovary with fewer ovules, and, more noticeably, the peduncled umbellate



inflorescence of very constant form, since it has almost invariably two flowers, rarely three.

*B. diantha* has the same garden value as *B. concinna* and will be useful for those who have room for more than one plant of the former, and yet prefer to have as much variety as possible within their collection.

I do not know the origin of this plant. It came to me labelled *B. aetnensis*, and may possibly be a hybrid.

**Berberis** (Sect. **Polyanthae**) **arido-calida** *Ahrendt*, sp. nov. ; affinis *B. parvifoliae* Sprague, a qua foliis latioribus haud integris, fasciculis plurifloris, pedicellis brevioribus, sepalis angustioribus, petalorum glandulis majoribus, fructibus angustioribus divergit ; affinis etiam *B. aggregatae* Schneid., a qua inflorescentiis haud paniculatis, floribus paucioribus praecipue distinguenda.

*Frutex* suberectus, usque 1.5 m. altus ; ramuli puberuli, angulato-sulcati, hornotini flavo-virides, annotini pallide flavo-brunnei. *Internodia* 1.2-1.7 cm. longa. *Spinae* trifidae, graciles, subtus subtiliter sulcatae, 8-13 mm. longae. *Folia* late elliptica vel late obovata, basi breviter cuneata, subsessilia, apice subacuta vel subobtusata, ramulorum fertiliū margine parce (utrinque 3-6) spinoso- (c. 1 mm.) subserrulata, surculorum saepe integra, supra opace viridia, subtus albido-pruinosa, papillosa, utraque facie anguste reticulata. *Inflorescentiae* 6-10 (-14)-florae, fasciculatae vel racemoso-subfasciculatae, 8-13 mm. longae. *Flores* c. 4 mm. diametientes. *Pedicelli* 1-2 mm. longi, basi bracteis triangularibus 1.5×1 mm. suffulti. *Prophylla* lanceolata vel anguste ovata, 2×0.8 mm. *Sepala* exteriora oblonga, obtusa, 2.5×1 mm., interiora oblonga-ovata, obtusa, 3.3×1.6 mm. *Petala* ovata, apice plus minusve truncata, vix emarginata, basi glandulis suborbiculatis c. 0.7×0.6 mm. praedita, 2.8×1.4 mm. *Stamina* 2 mm. longa, apice parum producta sed truncata. *Ovarium* ovulis 2 instructum. *Baccae* sanguineo-coccineae, elliptico-oblongae, 3-4×1.5-2 mm., stylo distincto, 0.5-1 mm. longo.

CHINA. Kansu : *Farrer* 355 (typus in Herb. Wisley.).

This very attractive and hardy species of which there is a well grown specimen at Wisley is referred to in Journ. R. H. S. 42, 61 (Oct. 1916), as "found in Kansu, North China, in the open upper alpine turf of the Siku-Satanee ranges, where it is small growing, 12-24 inches high, with tightly bunched blood scarlet berries, a native of hot dry regions," and it is from this characteristic of its habitat that its specific epithet has been derived. Its botanical position seems rather distinct. I have not seen any analysis published of this section, but it would seem to fall, apart from this species, into three easily marked divisions :

(1) Subsection **Eupolyanthae**\*—characterized by the very long (6-17 cm.) paniculate inflorescence with very many flowers,

\*Subsect. **Eupolyanthae** *Ahrendt*, subsect. nov.—Inflorescentiae elongatae (6-17 cm. longae), paniculatae, multiflorae, (25-) 35-100-florae ; ovula tantum 2.—Typus : *B. polyantha* Hemsl.

generally 25–100. This would include *B. polyantha* Hemsl., *B. Koehneana* Schneid. and *B. Prattii* Schneid. This last species seems to me to be quite distinct and best given specific rank and not reduced to a variety of *B. aggregata* as has sometimes been done. Most of the living plants passing under the name *B. polyantha* that I have met are really *B. Prattii* or a hybrid of it. The true *B. polyantha*, as the type herbarium specimens clearly show, possesses elongated fruit with a remarkably long style.

(2) Subsection **Subpolyanthae**\*—with a much shorter but still paniculate inflorescence with fewer flowers, 10–20 (–40), and only about (1–) 1.5–3 cm. long. Like those of the preceding subsection the members of this one show only 2 ovules within the ovary and generally have mature stems of the first years coloured a fairly pale yellowish brown. Here I should place *B. kunawurensis* Royle, *B. Edgeworthiana* Schneid., *B. aggregata* Schneid. and *B. brevipaniculata* Schneid.

(3) Subsection **Pseudopolyanthae**†—in which the inflorescence is no longer paniculate but only fascicled, or possibly racemose-subfascicled, possesses only 3–10 (–15) flowers, and is only about 4–12 mm. in length. Furthermore the members of this subsection possess 3–5 ovules and have fairly, or very, dark mature first year stems of a red or purple colour. The members of this section are *B. Wilsonae* Hemsl., *B. Stapfiana* Schneid., *B. subcaulialata* Schneid., *B. parvifolia* Sprague and *B. favosa* W. W. Smith. The second and third members of this list have been reduced in rank since description, and may quite well be regarded as varieties of *B. Wilsonae*. It is interesting to note that these species were originally placed, when described, in the section *Sinenses*, with which they have a certain affinity in their dark purplish stems and few-flowered fascicled or at most subracemose inflorescence. But their very distinctly stylose fruit separates them from the *Sinenses* and associates them with the *Polyanthae*. The possession of more than two ovules distinguishes this little group from the two preceding subsections as well as from the section *Sinenses*.

*Berberis arido-calida* is of interest because it does not fall exactly into this classification. The inflorescence is that of the subsection *Pseudopolyanthae*; but the number of ovules and the colour of the stems associate it rather with the preceding subsection, as indeed do also its spinose deciduous leaves, which are a character of the *Subpolyanthae* generally, contrasting with the subpersistent entire leaves of the *Pseudopolyanthae*. In this case I should regard the form of the inflorescence as the primary character and include *B. arido-calida* in the *Pseudopolyanthae*.

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\*Subsect. **Subpolyanthae** Ahrendt, subsect. nov.—Inflorescentiae brevipaniculatae (1–3 cm. longae), 10–20 (–40)-florae. Ramuli annotini pallide flavo-brunnei. Ovula 2.—Typus: *B. kunawurensis* Royle.

†Subsect. **Pseudopolyanthae** Ahrendt, subsect. nov.—Inflorescentiae fasciculatae vel racemoso-subfasciculatae. Ramuli annotini atro-purpurei. Ovula (2–) 3–5.—Typus: *B. Wilsonae* Hemsl.



While referring to *B. parvifolia*, Schneider (in Sarg. Pl. Wils. 3, 436: 1917) mentioned *Purdom* 826 (seed number) from W. Kansu, April 25th, 1912, as differing from *B. parvifolia* Sprague in having a fascicled inflorescence of up to 12 flowers, and only two ovules in the ovary. It seems likely that this number of Purdom should be referred to *B. arido-calida*.

In order to complete this reference to the classification of the Section *Polyanthae* it seems desirable to depart from my main purpose of dealing with species which are actually in cultivation and to refer to the following one which is only known to me through its herbarium sheet :

**Berberis oblanceolata** (Sect. **Polyanthae**, Subsect. **Subpolyanthae**) (*Schneid.*) *Ahrendt*, stat. nov.; ob folia integra oblanceolata affinis *B. Wilsonae* Hemsl., a qua inflorescentiis paniculatis subelongatis recedit.—*B. polyantha* var. *oblanceolata* Schneid. in Sarg. Plant. Wils. 1, 376 (1913).

*Frutex* decumbens, 1-1.6 m. altus. *Ramuli* puberuli, sulcati. *Folia* oblanceolata, integra, 1-2 cm. longa, 0.3-0.5 cm. lata, apice acuta. *Inflorescentiae* graciliter paniculatae, 10-15-florae, (2.5-) 3-4.5 (-5) cm. longae. *Pedicelli* 2-3 (-4) mm. longi.

CHINA. W. Szechuan: *Wilson* 2868 (typus in Herb. Kew.).

The preceding classification will show that this *Berberis* really differs very much from *B. polyantha*, and again like *B. arido-calida* lies between the last two subsections, but in a reflected sense, for now we find that the entire leaves associate it with the *Pseudopolyanthae*, while the form of the inflorescence, still the primary character, places it with the *Subpolyanthae*.

## XXXII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XII.\*

THE ANNONACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

The following abbreviations are used for works or periodicals frequently cited:—

ABGC = Ann. Roy. Bot. Gard.	NGBI = Nuovo Giorn. Bot. Ital.
Calc.	NTNI = Natuurk. Tijdschr.
FBI = Fl. Brit. Ind.	Nederl. Ind.
FMP = Fl. Mal. Penins.	PJS = Philipp. Journ. Sci.
JASB = Journ. As. Soc. Beng.	SMJ = Sarawak Mus. Journ.
KB = Kew Bull.	UCPB = Univ. Calif. Publ. Bot.

Small type indicates matter not directly relevant to the Oxford University Expedition's collection.

**Enicosanthum paradoxum** Becc. in NGBI. 3, 184, t.v, figs. 13-17 (1871), e descr. et ic.; Scheff. in NTNI. 34, 80 (1874); Ridley in SMJ. 1, no. 3, 73 (1913).

\* Continued from K.B. 1939, 31.

Dulit, primary forest, rocky valley of small stream, under 300 m., 22 Aug., *Richards* 1389: "Tree, c. 8 m. high. Cauliflorous. Petals cream coloured."

**Encosanthum erianthoides** *Airy-Shaw*, sp. nov., *E. eriantho* (Ridley) *Airy-Shaw*\* peraffinis, habitu caulifloro, ramulis persistenter villosa-tomentosis, foliis tenuioribus basi magis rotundatis subtus dense supra decidue fulvo-tomentosis, nervis utrinque dense villosis distincta.

*Arbor* 18 m. alta, trunco 17 cm. diametro, cortice circiter 1.5 cm. crasso radiis medullariis conspicuis, ligno saturate luteo. *Ramuli* dense persistenter fulvo-villosa-tomentosi, longitudinaliter sinuato-striati, 3–5 mm. diametro. *Folia* oblonga vel oblongo-elliptica vel suboblanceolata, 12–40 cm. longa, 6–13 cm. lata, basi truncato-rotundata, apice in uno folio rotundato-emarginato in ceteris manco, integra, chartacea, subtus dense breviter fulvo-tomentosa, supra (costa nervisque exceptis) evanide pubescens; costa supra subplana vel leviter impressa, subtus valde prominens, utrinque dense villosa-tomentosa; nervi primarii laterales 10–20-jugi, interstitiis 1–3 cm. latis sejuncti, quam in *E. eriantho* magis patuli et procurvi (angulo majore orti), graciliusculi, subtus prominentes; nervi secundarii gracillimi, inter primarios scalariformiter dispositi; petioli robusti, 1–1.5 cm. longi, usque 4 mm. diametro, dense fulvo-tomentosi. *Inflorescentiae* e nodis caulinis ortae, totae dense sericeo-tomentosae. *Pedunculi* brevissimi, 1–3-flori; bracteae ovatae, 5–10 mm. longae; pedicelli robusti, 1–1.5 cm. longi; bracteola 1, ovata, cordata, amplexicaulis, 5–10 mm. longa, apice pedicelli sita, sepalo extimo opposita. *Sepala* 3, late triangulari-ovata, 1–2 (plerumque circiter 1.6) cm. longa, basi 1–1.8 cm. lata, subcordata, subacuta, crassa, intus parcius sericeo-villosa. *Petala* 6, obovata, exteriora fere 3 cm. longa et 1–1.5 cm. lata, interiora 2–2.7 cm. longa et 1–1.2 cm. lata, omnia obtusa et plus minus cucullata, crassa, intus parce pubescentia et basin versus fere glabra. *Stamina* numerosa, complanato-oblonga, 4 mm. longa, 1–1.5 mm. lata, connectivo expanso oblique truncato interdum parce piloso. *Carpella* (? fertilia) circiter 20, linearia, 4 mm. longa, longe hirsuta, stigmate glabro anguste obconico. *Ovula* non visa. *Fructus* ignotus.

Dulit, primary forest on steep slope, under 300 m., 19 Aug., *Richards* 1353: "Tree, 18 m. high. Diam. 17 cm. Bark with conspicuous rays, c. 1.5 cm. thick. Wood dark yellowish. Fls. cauliflorous to near ground."

Vernacular name: *serebah mangis*.

The genus *Encosanthum* Becc. is apparently the same as *Griffithianthus* Merr. (*Griffithia* Maing. ex King, non Wight et Arn.), and I regard *Marcuccia* Becc. also as not generically distinct. As the name *Griffithianthus* is antedated

\* **Encosanthum erianthum** (Ridley) *Airy-Shaw*, comb. nov.—*Polyalthia eriantha* Ridley in KB. 1912, 384 (sphalm. *eriantha*), et in SMJ. 1, no. 3, 81 (1913).



by both Beccari's generic names, and as all three genera have hitherto been kept up, I propose to retain the name *Enicosanthum* for the aggregate genus, rather than suggest the conservation of *Griffithianthus*. It is closely related to *Polyalthia*, differing principally in the large size of the flowers and in the large leaves with numerous parallel nerves. Several species described in *Polyalthia* require transference.

***Enicosanthum acuminatum* (Thw.) Airy-Shaw.**

*Polyalthia acuminata* Thw. Enum. Pl. Ceyl. 399 (1864); Bedd. Ic. Pl. Ind. Or. 12, t. lvii (1869); Hook. f. et Thoms. in Hook. f. FBI. 1, 63 (1872); Trimén, Handb. Fl. Ceyl. 1, 25 (1843); King in ABGC. 4, 71, t. 98 (1893).

CEYLON.

***Enicosanthum congregatum* (King) Airy-Shaw.**

*Polyalthia congregata* King in JASB. 61 (2), 61 (1892), et in ABGC. l.c. 76 (1893).

MALAY PENINSULA.

***Enicosanthum coriaceum* (Ridley) Airy-Shaw.**

*Polyalthia coriacea* Ridley in KB. 1912, 383, et in SMJ. 1, no. 3, 82 (1913).  
SARAWAK.

***Enicosanthum cupulare* (King) Airy-Shaw.**

*Griffithia cupularis* King in ABGC. l.c. 9 (1893).  
*Griffithianthus cupularis* (King) Merr. in PJS. 10, 231 (1915).  
MALAY PENINSULA.

***Enicosanthum fuscum* (King) Airy-Shaw.**

*Griffithia fusca* King, l.c. 10 (1893).  
*Griffithianthus fuscus* (King) Merr. l.c.  
MALAY PENINSULA.

***Enicosanthum gigantifolium* (Merr.) Airy-Shaw.**

*Polyalthia gigantifolia* Merr. l.c. 246 (1915).  
PHILIPPINES.

***Enicosanthum grandiflorum* (Becc.) Airy-Shaw.**

*Marcuccia grandiflora* Becc. in NGBI. 3, 183, t. iii (1871); Scheff. in NTNI. 34, 79 (1874); Ridley in SMJ. 1, 73 (1913).  
SARAWAK.

***Enicosanthum grandifolium* (Elm.) Airy-Shaw.**

*Polyalthia grandifolia* Elm. Leaf. Philipp. Bot. 1, 292 (1908); Merr. in UCPB. 15, 66 (1929).  
*P. Nickersonii* Elm. l.c. 1733; cf. Merr. Enum. Philipp. Fl. Pl. 2, 160 (1923).  
*P. pinnatinervia* Elm. l.c. 1736; cf. Merr. in PJS. 10, 250 (1915).  
PHILIPPINES.

I reduce the above two species to *E. grandifolium* on Merrill's authority, but I suspect that *E. Klemmei* and *E. mindanaense* are also forms of the same species. The material at Kew is insufficient to decide this.

***Enicosanthum Klemmei* (Elm.) Airy-Shaw.**

*Polyalthia Klemmei* Elm. l.c. 1735.  
PHILIPPINES.

***Enicosanthum magnoliiflorum* (Hook. f. et Thoms.) Airy-Shaw.**

*Polyalthia magnoliaeflora* Hook. f. et Thoms. in Hook. f. FBI. 1, 64 (1872); King in JASB. l.c. 54 (1892).  
*Griffithia magnoliaepetala* Maing. ex King in ABGC. l.c. 9 (1893); Ridley, l.c. 26 (1922).  
*Griffithianthus magnoliiflora* (Hook. f.) Merr. in PJS. 10, 231 (1915); Craib, Fl. Siam. Enum. 1, 29 (1925).  
S. PENINSULAR SIAM; MALAY PENINSULA.

The epithet "*magnoliaeflora*" was ascribed to Maingay by Hooker and Thomson, l.c., but Maingay, as his specimens and manuscripts in Herb. Kew.

show, used the epithet "*magnoliaepetala*." King took this up in 1893 and was followed by Ridley in the FMP., but the modified epithet published in the Flora of British India is the valid one and should be ascribed to Hooker and Thomson.

**Enicosanthum mindanaëse** (Elm.) Airy-Shaw.

*Polyalthia mindanaënsis* Elm. l.c. 1734.

PHILIPPINES.

**Enicosanthum nitidum** (A.DC.) Airy-Shaw.

*Guatteria nitida* A.DC. Mém. Fam. Anon. in Mém. Soc. Phys. Genève, 5, 218 (reimpr. 41) (1832); Hook. f. et Thoms. Fl. Ind. 1, 143 (1855).

*Polyalthia nitida* (A.DC.) Benth. et Hook. f. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 64 (1872); King in ABGC. l.c. 83, t. 92 (1893).

*P. macrantha* King in JASB. l.c. 54 (1892) in ABGC. l.c. 68, t. 93 (1893); Ridl. FMP. 1, 58; Henderson in Gard. Bull. Str. Settlem. 4, 216 (1928); *synon. nov.*

MALAY PENINSULA; ? BURMA.

*Griffithianthus Merrillii* (C. B. Rob.) W. H. Br. ex Merr. is, as noted by Merrill, anomalous in this genus. Sterile material, probably of this species, was described by Miquel as *Uvaria acuminatissima*, and a closely allied species was described by Hooker and Thomson as *Popowia foetida* Maing. These species do not appear to fit satisfactorily into any genus hitherto described, and the following new one is proposed for their reception.

**Neo-uvaria** Airy-Shaw, gen. nov., *Uvariae* affinis, petalis exterioribus aestivatione alabastri vitta mediana elevata petalorum interiorum sejunctis, fructibus partialibus maximis oviformibus monospermis distincta.

*Sepala* parva, deltoideo-ovata, aestivatione aperta (nec distincte valvata nec imbricata), ab initio patentia. *Petala* 6, subaequalia, sub anthesin patentia: exteriora aestivatione valde aperta, alabastro interioribus arcte adpressa, marginibus vitta (vel area anguste triangulari) mediana elevata canaliculata petalorum interiorum omnino sejunctis; interiora stricte valvata, ima basi levissime separata (velut initia vel vestigia unguicularum exhibentia), apice incrassata; omnia dense tomentella. *Stamina* 20-30, brevissima, connectivo latissimo convexo-truncato. *Carpella* 4-12, oblongo-ovoidea, longe pubescentia; stylus clavatus, glaber; ovula 1 vel 2. *Fructus partiales* 1-12, mediocres usque maximi, oblongo-ovoidei, brevissime et crasse stipitati vel subsessiles, dense breviter fulvo-tomentosi, pericarpio crustaceo usque tenuiter lignoso; semen solitarium, carpellum fere implens, testa ossea.

*Arbores* mediocres vel magnae. *Ramuli* graciliusculi, juniores cum innovationibus fulvo-velutini, demum glabrescentes, cortice cinereo. *Folia* mediocria, plus minus elliptica, acuminata, breviter petiolata, subtus dense vel parce stellato- vel fasciculato-tomentosa vel -pubescentia, conspicue laxè graciliter nervosa, nervis primariis adscendentibus parallelis, secundariis inter primarios scalariformiter parallelis. *Flores* parvi, lutescentes, ex axillis foliorum delapsorum secus ramulos annotinos per 1-3 fasciculatim orti, breviter pedicellati, petalis sub anthesin omnibus late patentibus.

Species forsan 2, Peninsulae Malaicae insularumque Sumatrae, Borneonis necnon Philippinensium incolae. Typus: *N. foetida* (Maing. ex Hook. f. et Thoms.) Airy-Shaw.

**Neo-uvaria foetida** (Maing. ex Hook. f. et Thoms.) Airy-Shaw, comb. nov.

*Popowia foetida* Maing. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 69 (1872); FMP. 1, 76.

MALACCA. Maingay 1053, 1349, 1349A.

Not certainly known from any other locality or collection, but possibly represented by *Beccari* 2671 from Sarawak, and *Elmer* 21183 from Tawao, Brit. N. Borneo, on account of the very large fruits.

**Neo-uvaria acuminatissima** (Miq.) Airy-Shaw, comb. nov.

*Uvaria acuminatissima* Miq. in Ann. Mus. Bot. Lugd.-Bat. **2**, 6 (1865); Ridley in SMJ. **1**, no. 3, 74 (1913).

*Mitrephora ferruginea* Merr. in Gov. Lab. Publ. (Philipp.) **17**, 16 (1904), excl. descr. fl., et in PJS. **1**, Suppl. **54** (1906); non Boerl.

*Mitrephora Merrillii* C. B. Rob. in Bull. Torr. Bot. Club, **35**, 67 (1908).

*Mitrephora viridifolia* Elm. Leaf. Philipp. Bot. **5**, 1716 (1913).

*Griffithianthus Merrillii* (C. B. Rob.) W. H. Brown ex Merr. in PJS. **10**, 231 (1915); Merr. in UCPB. **15**, 74 (1929).

PENANG. Pulau Boetong, March 1892, Curtis 2768: "tree 30-40 ft."

SUMATRA. Sibolangit: Bukit Semaik, 5 Aug. 1921, Md. Nur 7448: "true 40-50 ft., flower yellow."

DUTCH S.E. BORNEO. Dusun River, Korthals (type).

BRIT. N. BORNEO. Sine loc., Sept. 1919, Agama 737. Tawao, Elmer 20423, 21112 (cf. Merrill l.c. 1929). Bettotan, logged area, alt. 22 m., 16 Apr. 1933, Orolfo in For. Dept. 3085: "shrub, 8 ft. high, 3 in. girth." Hulu Bole, edge of stream, 360 m., 30 Apr. 1933, Puasa in For. Dept. 3110: "tree, 25 ft. high, 9 in. girth; fruit like olive, hairy, used for treating fever in children." Bode Gaya Forest Reserve, Semporna, edge of river, 24 Feb. 1935, Mail in For. Dept. 4339: "tree, 15 ft. high, 12 in. girth; fruit brown, hairy."

PHILIPPINES. See Merrill, Enum. Philipp. Fl. Pl. **2**, 154 (1923).

Vernacular names (North Borneo): *pisang-pisang* (Kedayan, Bajau); *kayu bisising* (Idahan).

This genus is certainly closely related to *Uvaria*, and would be included in it but for the fact that certain other closely related species, not more distinct than *Neo-uvaria*, are currently given generic rank, e.g., *Anomianthus* Zoll., *Rauwenhoffia* Scheff. and *Uvariella*\* Ridley.

The imbrication of the petals in *Neo-uvaria* is, of course, exceptional for the tribe *Uvarieae*. This tribe would therefore probably be better defined by reference to the stellate indumentum.

I am uncertain how many species can usefully be distinguished. Only a limited amount of flowering material is available, and I therefore provisionally maintain the two species given above, separating them as follows:

Leaves densely and uniformly tomentose below; flower-buds subglobose; ovules generally 2; fruiting carpels very large, up to 5.5 cm. long by 3.3 cm. in diameter.....*N. foetida*

Leaves never so densely tomentose, often merely pubescent or almost glabrous between the nerves; flower-buds oblong; ovule 1; fruiting carpels much smaller, 1.5-3.7 cm. long by 0.7-2.6 cm. in diameter.....*N. acuminatissima*

**Polyalthia insignis** (Hook. f.) Airy-Shaw, comb. nov.

*Sphaerothalamus insignis* Hook. f. in Trans. Linn. Soc. **23**, 156 (1860); Becc. in NGBI. **3**, 190 (1871); Scheff. in NTNI. **34**, 85

\* A second species of this genus is *Uvariella ferruginea* (Ham. ex Hook. f. et Thoms.) Airy-Shaw, comb. nov. [*Uvaria ferruginea* Ham. ex Hook. f. et Thoms. Fl. Ind. **1**, 96: 1855; *Ellipeia ferruginea* (Ham. ex Hook. f. et Thoms.) Hook. f. et Thoms. in Hook. f. FBI. **1**, 52: 1872; Williams in Bull. Herb. Boiss. sér. **2**, **5**, 23 (1904), *pace* Craib, Fl. Siam. Enum. **1**, 32: 1925! *Ellipeia cherrevensis* Pierre ex Fin. et Gagnep. in Bull. Soc. Bot. Fr. Mém. **4**, 76: 1906]. This is known from E. Bengal, Burma, Siam and Indo-China. Additional records for the original species, *U. leptopoda* (King sub *Ellipeia*) Ridley, are the following: JOHORE: Muar, Apr. 1901, Curtis 3617; Batu tiyoh, Sungei Tebrau, Castlewood, 23 Apr. 1905, Ridley 12215; SINGAPORE: Toas, 29 May 1890, Gamble in Ridley 2124. The last two specimens are erroneously cited by Ridley, FMP. **1**, 32, under *Uvaria Ridleyi* U. The latter and *U. astrosticta* Miq. (Ridl. l.c. 34) are identical with *U. rufa* Bl.



(1874) ; Gibbs in Journ. Linn. Soc. **42**, 57 (1914) ; Ridley in SMJ. **1**, no. 3, 73 (1913), cum var. *parviflora* Ridl.

? *Unona miniata* Elm. Leaf. Philipp. Bot. **5**, 1740 (1913).

*Polyalthia dolichophylla* Merr. in PJS. **14**, 391 (1919), et in UCPB. **15**, 65 (1929).

? *P. Elmeri* Merr. Enum. Philipp. Fl. Pl. **2**, 160 (1923).

Gunong Balapau, Ulu Tinjar, alt. c. 300 m., near small stream, primary forest, 1 Feb., *Richards* 2456 : " Tree c. 4 m. high. Perianth creamy yellow, segments with orange patch at base internally on upper side of flower only. Fls. borne on leafless part of large branch."

This polymorphic and locally common species cannot be maintained generically distinct from *Polyalthia*, in which indeed it has at least once been independently described. Field studies are required in order to determine whether more than one distinct species are involved. It is practically impossible to decide this from existing herbarium material owing to the great and rapid increase in size of the floral parts before and during anthesis, and the foliage offers few distinctive characters.

*Polyalthia insignis* is closely related to *P. microtus* Miq. in Ann. Mus. Bot. Lugd.-Bat. **2**, 13 (1865), synonyms of which appear to be *Unona jambosifolia* Ridley [KB. 1912, 384 ; SMJ. **1**, no. 3, 80 : 1913 ; *Desmos jambosifolia* (Ridley) Merr. in Journ. Roy. As. Soc. Str. Br. spec. no. 255 : 1921], *Polyalthia Elmeri* Merr. (UCPB. **15**, 66 : 1929 ; non Merr. 1923, supra !), and *P. subcordata* Bl. sec. Merr. (l.c. 67), non Bl.

***Polyalthia sumatrana*** (Miq.) Kurz in JASB. **43** (2), 53 (1874), emend. King in JASB. **61** (2), 53 (1892) ; Ridley in SMJ. **1**, no. 3, 80 (1913) ; Ridl. FMP. **1**, 52.

*Guatteria sumatrana* Miq. Fl. Ind. Bat. Suppl. 380 (1860).

Ulu Koyan, sandy rain-forest, 800–1000 m., 18 Sept., *Native Collector* 1918 : " Tree, 22 m. high, 24 cm. diam. No buttresses. Perianth segments dull yellowish internally, tinged with red externally, greenish at base."

Vernacular name : *selaut gunong*.

***Polyalthia tenuipes*** Merr. in Journ. Roy. As. Soc. Str. Br. **85**, 184 (1922).

Dulit, primary forest on slope of ridge, under 300 m., 21 Oct., *Richards* 2306 : " Tree, 6.7 m. high. Fls. hanging down on long flexible peduncles. Perianth dull reddish purple. Twigs and flowers smelling of guavas."

Vernacular name : *serebah*.

***Polyalthia Motleyana*** (Hook. f.) Airy-Shaw, comb. nov.

*Oxymitra Motleyana* Hook. f. in Trans. Linn. Soc. **23**, 155 (1860) ; Ridley in SMJ. **1**, no. 3, 88 (1913).

Hooker suggested no affinity for his species and gave no reasons for placing it in *Oxymitra*. His original description being very short, a more extended one is herewith provided.

Species *P. chrysotrichae* Ridley et *P. oblongae* King affinis, sed floribus brevissime pedicellatis differt; a priore insuper foliis floribusque minoribus, a posteriore perianthii segmentis dense sericeo-villosis recedit.

*Arbor* parva, 3-4 m. alta, ramulis graciliusculis circiter 4 mm. crassis vetustioribus glabrescentibus cortice cinerascente hornotinis 2 mm. crassis dense breviter subfulvo-velutinis. *Folia* oblanceolata, interdum oblique elliptico-oblanceolata, 10-30 cm. longa, 3-10 cm. lata, basi rotundata vel late cuneata, apice rotundata vel brevissime cuspidato-acuminata, margine integerrima et fere plana, chartacea, siccitate supra grisea subtus brunnescentia, utrinque sparse pilosa subtus densius, pilis supra e foveolis minutis ortis; costa supra pilosa, vix impressa, subtus valde tereti-elevata, dense breviter subtomentosa, pube patente fulvescente; nervi laterales 15-20-jugi, patuli, arcuati usque subrecti, graciles, prope marginem arcuato-anastomosantes et nervum intramarginalem efformantes, supra vix impressi, subtus argute prominentes et pubescentes, rete venularum laxo; petioli 3-7 mm. longi, 2-3 mm. crassi, dense fulvescenti-tomentosi. *Flores* conspicue extra-axillares, saepe inter folia adjacentia fere medii, e ramis hornotinis orti, pedicello subnullo usque 5 mm. (raro 1 cm.) longo dense tomentoso. *Sepala* ovato-deltoidæa, 8-9 mm. longa et fere aequæ lata, plerumque acuta, extra longe dense tomentosa, intus glabra. *Petala* exteriora late lanceolata, circiter 1.5 cm. longa, 7-8 mm. lata, obtusa usque acuta, interiora oblongo-elliptica, circiter 1.5 cm. longa, 5-6 mm. lata, obtusiuscula, omnia extra dense longe sericeo-tomentosa, intus glabra et verruculosa. *Stamina* numerosissima, cuneiformia, 2.5 mm. longa, glabra, apice expanso plano, in massam 8-9 mm. diametro conglobata. *Carpella* dense longe hirsuta. *Fructus* ignotus.

Dulit, secondary forest, said to be about 40 years old, under 300 m., 23 Aug., *Richards* 1408 (typus, Herb. Kew.): "Small tree, c. 3-4 m. high."

Gunong Balapau, Ulu Tinjar, IVth Division, primary rain forest, c. 400-500 m., 2 Nov., *Richards* 2387: "Tree, c. 4 m. high. Perianth brownish straw colour."

SARAWAK. Sine loc., *Beccari* 1624; *Garai* in *Haviland* 418 (d.m.r.b.). Near Kuching, 6 Nov. 1894, *Haviland & Hose* "= 418 A": "1-2 ft. high; carpels 2-ovuled, very hairy, style cohaering, stigmas hairy." Baram, May 1894, *Haviland & Hose* 3736.

There is evidently a complex of closely allied forms related to *Polyalthia oblonga* King. One such form is *P. chrysotricha* Ridley, described from imperfect material and hitherto known only from the type gathering (Ulu Langat, Selangor), but apparently also represented by an imperfect specimen from Brastagi, SUMATRA, collected by *Ridley* (s.n.) in Feb. 1921. Closely

related to *P. chrysotricha* is *P. velutinosa* Ridley, with smaller leaves pubescent below.\*

The following variety is somewhat intermediate between *P. Motleyana* and *P. oblonga* :

**P. Motleyana** var. **glabrescens** *Airy-Shaw*, var. nov. foliis costa utrinque brevissime tomentella excepta glabris vel fere glabris exsiccando subrubro-brunneis, nervis lateralibus in nervum submarginalem conspicue arcuato-conjunctis.

*Guatteria* ? *multinervis* Wall. Cat. no. 6445 (1832), *nomen*.

*Polyalthia cinnamomea* Hook. f. et Thoms. Fl. Ind. **1**, 138 (1855) et in Hook. f. FBI. **1**, 65 (1872), quoad syn. *G. multinervis* et flor. descr. ; King in JASB. **61** (2), 66 (1892), quoad syn. *G. multinervis* Wall. tantum.

PENANG. "From the Hills," *G. Porter* in Wallich 6445 : "a small tree ; fl. brown." Government Hill, 360 m., April, *Curtis* 1409 : "erect undershrub."

PERAK. Hermitage, 600-900 m., Dec. 1887, *Curtis* 1277 : "small tree." SINGAPORE. *Lobb*.

SARAWAK. Sine loc., *Beccari* 1621, 1813 (typus, Herb. Kew). Mt. Koum, limestone, 21 Sept. 1892, *Haviland* 1711.

The variety *glabrescens* approaches *P. oblonga* King, in that the pedicels are sometimes rather longer and the petals rather less sericeous than usual, especially in the Peninsula specimens.

The confusion of this plant with the very different *P. cinnamomea* Hook. f. et Thoms. originated with Wallich's note in his catalogue, under no. 6445, *Guatteria* ? *multinervis* Wall. : "(an eadem ac *G. cinnamomea* ?)." The type-specimen of *G. ? multinervis* is in flower, while that of *G. cinnamomea* is in fruit, and these two specimens formed the whole basis of *Polyalthia cinnamomea* Hook. f. et Thoms. It is logical to make the specimen of *Guatteria cinnamomea* Wall. the lectotype of Hooker & Thomson's species, since those authors took their epithet from it, and King interpreted *P. cinnamomea* in this sense, though apparently without realising that the original description of the flowers was quite inapplicable to those of his plant.

**Polyalthia cauliflora** Hook. f. et Thoms. Fl. Ind. **1**, 138 (1855), et in Hook. f. FBI. **1**, 66 (1872) ; Ridley in Journ. Roy. As. Soc. Str. Br. **75**, 6 (1917) ; Ridl. FMP. **1**, 51 ; Craib, Fl. Siam. Enum. **1**, 41 (1925).

*Uvaria cauliflora* Wall. Cat. 6476 (1832), *nomen*.

*Guatteria Teysmanni* Miq. Fl. Ind. Bat. Suppl. 378 (1860).

*G. ? palembanica* Miq. l.c. 379, teste Miq. in Ann. Mus. Bot. Lugd.-Bat. **2**, 19 (1865).

*Monoon Teysmanni* (Miq.) Miq. in Ann. Mus. Bot. Lugd.-Bat. l.c.

*Polyalthia macrorhyncha* Miq. l.c. 14 ; Boerl. in Ic. Bogor. **1**, 108 (1899).

*Unona desmantha* Hook. f. et Thoms. in Hook. f. l.c. 61 (1872) ; King in JASB. **61** (2), 48 (1892).

*Polyalthia Beccarii* King, l.c. 65 (1892) ; Ridley in SMJ. **1**, no. 3, 80 (1913) ; Ridl. FMP. **1**, 50 ; Merr. in SMJ. **3**, 523 (1928).

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\* Additional record for *P. velutinosa* Ridley :

PAHANG. Sunget Yet, Bukit Fraser, 1110 m., 28 Aug. 1923, *Md. Nur* 11127 : "Tree 30 ft. high ; fls. large, brown hairy." Fraser Hill, 1200 m., 28 Aug. 1923, *Henderson* 11421.

*Henderson* 11421 was distributed as "*Polyalthia cinnamomea* var. ?" The fruits of the two species are very similar, but the flowers are utterly different.



*P. Teysmanni* (Miq.) King, l.c. 66 (1892), in obs. ; Boerl. in Ic. Bogor. 1, 107 (1899) ; Ridley in SMJ. l.c.

*Desmos desmanthus* (Hook. f. et Thoms.) Safford in Bull. Torr. Bot. Club, 39, 508 (1912).

*Polyalthia desmantha* (Hook. f. et Thoms.) Ridley in Journ. Roy. As. Soc. Str. Br. 75, 6 (1917) ; Ridl. FMP. 1, 49 ; Merr. in Pap. Mich. Acad. Sci. 20, 96 (1935).

Dulit, primary forest on steep slope, under 300 m., 19 Aug., Richards 1354 : " Tree, c. 25 ft. [7.5 m.] high, diam. 3" [7.5 cm.]. Bark with conspicuous rays, smelling of guava jelly. Fls. pale yellowish green, cauliflorous."

Vernacular name : *serebah*.

Dulit, secondary forest on ridge (said to be about 40 years old), under 300 m., 23 Aug., Richards 1405 : " Tree, c. 8 m. high. Cauliflorous. Petals cream coloured. Fls. with peculiar sickly sweet smell."

Dulit, primary forest on steep ridge, under 300 m., 17 Oct., Richards 2249 : " Tree, 8.5 m. high, 8 cm. diam. Bark 0.4 cm. thick, with strongly marked medullary rays. Wood smelling of guava. Young leaves drab, hanging limply. Cauliflorous flowers from 1.5 m. above ground to about 1.5 m. from top on main shoot and larger branches. Fls. with smell of rotten fruit when old. Few insect visitors, one Meliponine bee noticed. Many trees of same species in flower at same time in neighbourhood."

Vernacular name : *selaut* or *bigis*.

I have been quite unable to find any characters whereby to distinguish *P. Teysmanni* and *P. Beccarii* from *P. cauliflora*. They appear to represent forms of one common and moderately variable species. Ridley suggests (FMP. l.c.) that *P. pycnantha* (Hook. f. et Thoms.) King may also be merely a form of *P. cauliflora* : this seems very likely, and moreover *P. Wrayi* (Hemsl.) Ridley is scarcely separable. The available material of these two species is hardly sufficient, however, to warrant their reduction.

***Polyalthia flagellaris*** (Becc.) Airy-Shaw, comb. nov.

*Unona flagellaris* Becc. in NGBI. 3, 186 (1871) ; Ridley in SMJ. 1, no. 3, 79 (1913).

*Desmos flagellaris* (Becc.) Merr. in Journ. Roy. As. Soc. Str. Br., spec. no 255 (1921).

Dulit, opening in primary forest on steep ridge, under 300 m., 16 Aug., Richards 1300 : " Tree, c. 11 ft. [3.3 m.] high. Diam. 2" [5 cm.]. Flowering near base, from trunk. Petals yellowish green. Bark smelling of guava jelly."

Dulit, primary forest, under 300 m., 23 Aug., Richards 1407 : " Tree, c. 4 m. high. Fls. produced on small leafless twigs from near base of main stem. Petals dull red. Bark and twigs with strong smell of guava jelly."

Certainly a *Polyalthia*, related to *P. cauliflora* Hook. f. et Thoms. and its allies. The peculiar habit is comparable with that of *P. hypogaea* King.

**Woodiella sympetala** Merr. in Journ. Roy. As. Soc. Str. Br. **85**, 188 (1922).

var. **grandifolia** Airy-Shaw, var. nov., foliis 34-41 cm longis 12-16 cm. latis subpandurato-oblongeolatis, nervis 19-24-jugis distincta.

Dulit, stream-side in primary forest, under 300 m., 31 Aug., Richards 1574: "Tree, c. 6 m. high. Cauliflorous. Fls. yellowish green in bud."

A very slight tendency to the subpandurate shape which is so noticeable in this specimen is also observable in some of the smaller leaves of *Ramos* 1808, one of the original specimens cited by Merrill.

**Goniothalamus Tapis** Miq. Fl. Ind. Bat. Suppl. 371 (1860); Ridley in SMJ. **1**, no. 3, 84 (1913); Ridl. FMP. **1**, 67.

Dulit Trail, rocky rain-forest undergrowth, under 300 m., 9 Aug., Richards 1170: "Tree, c. 8 m. high. Fls. and fruit reddish."

As a contribution to the question whether this species is really distinct from *G. malayanus* Hook. f. et Thoms. (cf. Corner in Gard. Bull. Str. Settle. **10**, 13: 1939), the following observations may be placed on record.

I have examined type or authentic material of both species, that of *G. Tapis* being somewhat fragmentary and lacking fruit. I have found it possible to sort the Kew material into two groups corresponding reasonably closely with the type sheets. A study of the two series of specimens reveals the following points as probably significant:

	<i>G. malayanus.</i>	<i>G. Tapis.</i>
Leaves ...	8-16 (-25) cm. long, 3-7 cm. wide, usually drying black or blackish-green above, often rather shining, most often relatively narrow- ly oblong.	15-25 (-33) cm. long, 6-8 (-12) cm. wide, usually drying brownish above, rarely shining,  most often broadly elliptic- oblong.
Outer petals {	acute or rather broadly acuminate, more conspicuously ferrugineous-adpressed- pubescent.	usually finely and very acutely acuminate, glabrous or glabrescent or sparingly minutely ferrugineous-adpressed- puberulous.
Fruits ...	large, oblong, 2-seeded.	small, ellipsoid, 1-seeded.

#### SPECIMENS EXAMINED.

**G. malayanus** Hook. f. et Thoms.:

MALAY PENINSULA. Malacca, Griffith 402 (type); Maingay 1038 A, 1046. Perak, King's Collector 4746, 7139. Selangor, Kloss 15, 27.

SUMATRA. Indrageri, Sungei Laloh, Curtis 3552.

BANGKA. Teysmann (distrib. as *G. Slingelandtii* Scheff.).

DUTCH BORNEO. Korthals (distrib. as *G. dispermus* Miq.); Banjarmasin, Molley 1127.

SARAWAK. Near Kuching, Haviland 6 (b.o.r.c.), 925 (d.x.f.c.), "= 925."

BRIT. N. BORNEO. Tenom, hill, 90 m., Melegrito in For. Dept. 2590; Mengalong, swampy forest area, Keith in For. Dept. 2598.

### G. Tapis Miq. :

MALAY PENINSULA. Malacca, Maingay 3061 (fruits of *G. malayanus*, doubtless from no. 1046, mounted on both the Kew sheets of no. 3061). Perak, *King's Collector* 1973, 5105, 6527; *Scortechini* 1726. Penang, *Curtis* 302. Pangkore, *Curtis* 1634.

SUMATRA. Lubu Alang, *Teysmann* (paratype); sine loc., *Korthals*.

SARAWAK. Sine loc., *Beccari* 357, 788, 1836; Rock Rd. [nr. Kuching], 2nd Mile, *Haviland* 405 (c.l.q.c.); Baram, *Haviland & Hose* 3150; nr. Kuching, *Haviland & Hose* 3338 (?); Bau, *Ridley* 11767; Matang, *Ridley* 11768; sine loc., *Native Collector* (for Bur. Sci. Manila) 853; Dulit, *Richards* 1170.

I conclude that the two species are distinct, but that their ranges of variation overlap in many respects. The character of the fruit, however, appears to be constant for each.

**Goniothalamus** sp. aff. *G. malayano* Hook. f. et Thoms. et *G. Tapis* Miq.

Dulit, primary forest on slope of ridge, under 300 m., 21 Oct., *Richards* 2305: "Tree, c. 3 m. high. Perianth yellowish green. Twigs when broken with strong, peculiar and very pleasant smell. Fl. on upper branch."

This specimen might almost equally well be placed in either species. Such "intermediate" specimens are, however, noticeably rare, and the fruit (here unfortunately lacking) would probably be decisive. The leaves are very similar to those of a long-petalled group from British North Borneo which has been identified by Merrill with his *G. suluensis*.

**Goniothalamus cylindrostigma** *Airy-Shaw*, sp. nov., *G. uvaroidi* King affinis, sed foliis subduplo longioribus triente angustioribus, nervis multo distantioribus, floribus subduplo minoribus, carpellis 2-ovulatis stylis cuneato-truncato-expansis convolutis satis distincta.

*Frutex* usque 1 m. altus. *Rami* teretes, usque 7 mm. diametro, cortice pallido glabro aromatico. *Folia* anguste oblanceolata, 50-65 cm. longa, 6-10 cm. lata, basi angustato-rotundata, apice acuta vel breviter acuminata, margine angustissime revoluta, glaberrima, leviter bullata, chartacea, supra griseo- vel olivaceo-viridia, subtus griseo- vel brunneo-viridia; costa supra angustissime impresso-sulcata, subtus valde prominens, circiter 1.5 mm. lata, subteres; nervi laterales 28-30-jugi, utrinque (sed maxime subtus) prominuli, graciles, late patentes, conspicue arcuatim anastomosantes; petioli usque 1 cm. longi et 5 mm. diametro, fusci, supra canaliculati, glabri. *Flores* solitarii, axillares vel (foliis delapsis) caulini. *Pedicelli* 1-1.5 cm. longi, glabri, fusci. *Calyx* synsepalus, basi intrusus, 7-8 mm. diametro, undulatus, 6-lobus, lobis sepalinis 3 deltoideis acutis, intersepalinis rotundatis brevioribus, omnibus dorso et margine minutissime ferrugineo-puberulis. *Petala exteriora* anguste deltoideo-lanceolata, 2-3.5 cm. longa, basi rotundata 5-6 mm. lata, in apicem acutum sensim attenuata, crassa, utrinque minute ferrugineo-puberula, intus basi



fusco- vel fere fuligineo-tomentella. *Petala interiora* lanceolata, 2-2.3 cm. longa, 6-8 mm. lata, supra basin angustatam liberam conniventia et usque ad apicem arcte valvato-connexa, acuta, marginibus fulvo-tomentella, intus basi rugulosa et fuligineo-tomentella. *Stamina* valde numerosa, 3 mm. longa, connectivo mitriformi brunneo minute papilloso. *Carpella* circiter 12, oblonga, 1.5 mm. longa, pubescentia, stylo vaginiformi (latere fisso) glabro 3.5 mm. longo in stigma expanso-cuneatum apice truncatum marginibus convolutis desinente, ovulis 2. *Fructus immaturi* subglobosi, circiter 1 cm. diametro, minute apiculati, 6 mm. stipitati, monospermi.

Dulit, river bank forest, under 300 m., 18 Aug., *Native Collector* 1334 (typus, Herb. Kew.): "Shrub, 1 m. high. Fls. green. Leaves somewhat bullate. Bark with pleasant aromatic scent."

Dulit, primary forest on ridge, under 300 m., 31 Aug., *Richards* 1553: "Shrub, under 1 m. high. Perianth creamy yellow. Wood with pleasant smell."

The type of stigmatic structure found in the present species and apparently in *G. warioïdes* King (cf. Ann. Roy. Bot. Gard. Calc. 4 (3), t. 143, fig. 7) is shared also by *G. latistigma* C. E. C. Fischer (in Kew Bull. 1927, 204, c. fig.). The latter species, however, differs considerably in characters of foliage, sepals, inner petals and anther-connectives. The drawing of the stigma of *G. warioïdes* published by King (l.c.) shows the structure only partially, but the longitudinal slit down the style is visible. This is not alluded to in the text (l.c. 100). The 4-ovulate character of the carpels appears to be of minor importance, since the species associated on this basis by Boerlage (in Ic. Bogor. 1, 136: 1899) as Sect. *Beccariodendron* (Warb.) Boerl. show little evidence of affinity on other grounds.

In foliage, and especially in nervation, the present species strongly resembles *G. sesquipetalis* Hook. f. et Thoms.

**Goniothalamus velutinus** *Airy-Shaw*, sp. nov., foliis et indumento *G. Curtisii* King simillimus, sed nervis duplo distantioribus, sepalis parvis, connectivis rotundatis nec conicis recedit; florum structura *G. fulvo* Hook. f. et Thoms. accedens, sed ramis fusco-ferrugineo-velutinis, foliis multo majoribus pubescentibus valde distincta.

*Arbor* parva, circiter 6 m. alta, cauliflora. *Caulis* (parte florifera) gracilis, 7-8 mm. diametro, cortice pallido. *Ramuli* teretes, 3-5 mm. diametro, dense fusco-ferrugineo-velutini. *Folia* oblanceolata, 40-42 cm. longa, 8.5-10 cm. lata, basi rotundata, apice subabrupte breviter deltoideo-acuminata, acumine acutissimo 1.5-2 cm. longo, margine levissime incurva, tenuiter chartacea, siccitate olivacea, utrinque (maxime subtus, supra praecipue secus nervos) longiuscule patenti-pubescentia pilis fusco-ferrugineis; costa supra impressa, dense longiuscule pilosa, subtus prominens, patenter pilosa, inferne dense velutina; nervi laterales 22-25-jugi, graciles, late patentes, sursum arcuati et obscure reticulatim anastomosantes, utrinque prominuli; petioli tumidi, 1.8 cm. longi, 5 mm. crassi, ut ramuli

dense velutini. *Flores* (? immaturi) virides, perianthio ferrugineo-sericeo; pedicelli 5–9 mm. longi; bracteolae circiter 4, basales, 2–4 mm. longae. *Sepala* deltoideo-ovata, breviter connata, circiter 7 mm. longa et 4 mm. lata, acuta. *Petala exteriora* ovato-lanceolata, usque 1.8 cm. longa et 8 mm. lata, basi rotundata, intus area ovata 3 mm. longa minute tomentella notata, apice acuminato-attenuata. *Petala interiora* ovata, usque 1.2 cm. longa et 6 mm. lata, basi libera subcuneata circiter 4 mm. longa, ceterum usque ad apicem subacutum arcte valvato-connata, marginibus reflexis tomentellis. *Stamina* numerosissima (circiter 140), cuneato-oblonga, vix 2 mm. longa, connectivo hemisphaerico minute tomentello. *Carpella* 12–16, fusiformia vel ovoidea, circiter 2 mm. longa, basi longe ferrugineo-hirsuta, stylo subnullo, stigmatibus parvis minute bilobis. *Fructus* ignoti.

Dulit, by small stream, primary forest, under 300 m., 31 Aug., *Richards* 1559: "Small tree, c. 6 m. high. Fls. green, cauliflorous."

In its large leaves and in the dark-rusty velvety indumentum of the branchlets and petioles this is very distinct from all species except *G. Curtisii*, which is immediately separable from *G. velutinus* by its large membranous sepals. In *G. Curtisii*, moreover, the main lateral nerves (i.e., those which anastomose near the margin) are on the average about 1 cm. apart (as against 1.5–2 cm. in the present species) and the marginal anastomosis is much more clearly marked. *G. fulvus* has flowers very similar to, but somewhat larger than, those of *G. velutinus*, but, being otherwise quite glabrous, it presents a very different facies in the vegetative parts.

It is doubtful whether the carpels are normal in the available material of *G. velutinus*. In the best-developed flower they are markedly rugulose, and no ovules could be detected. Those of younger flowers also appear somewhat malformed. None of King's figures show a comparable type of carpel and stigma.

**Fissistigma Kingii** (Boerl.) Burkill in KB. 1935, 317, et Dict. Econ. Prod. Mal. Penins. **1**, 1021 (1935).

*Melodorum parviflorum* Scheff. sec. King in JASB. **61** (2), 107 (1892), non Scheff.

*M. Kingii* Boerl. in Ic. Bogor. **1**, 134 (1899).

var. **multinerve** *Airy-Shaw*, var. nov. nervis primariis circiter 23–25 (nec 16–17)-jugis, alabastris longioribus angustioribus acuminatis (15×5 mm. nec 11×6 mm.).

Dulit Trail, stony primary forest in valley, under 300 m., 10 Aug., *Richards* 1192: "Woody climber on tree 90' high. Sepals [i.e. outer petals] light brown externally, creamy white internally; petals creamy white; texture of both somewhat fleshy."

var. **grandiflorum** *Airy-Shaw*, var. nov. nervis ut in typo, alabastris magnis suboblongis 22 mm. longis 9 mm. latis.

SARAWAK. Near Kuching, 13 Nov. 1894, *Haviland & Hose* 3336K: "flowers scented when cut."

The following specimen is intermediate between this variety and the type :

SUMATRA. Goerach Batoe, Asahan, *Yates* 1749.

var. **tomentosum** *Airy-Shaw*, var. nov. nervis ut in var. *multinervi*, floribus fere ut in var. *grandifloro*, foliis subtus dense ferrugineo-tomentosis (nec tenuiter rubiginosis).

SARAWAK. Sine loc. exact., *Beccari* 3787.

var. **fagifolium** (*Ridley*) *Airy-Shaw*, stat. nov.

*Melodorum fagifolium* *Ridley* in KB. 1912, 386, et in SMJ. 1, no. 3, 91 (1913).

A typo differt foliis tantum 7–11 cm. longis, nervis 5–10-jugis.

SARAWAK. Entoyut River, Dec. 1894, *Hose* 397.

This is very close to typical *Kingii*, and probably not worth distinguishing. It has neither the glaucous leaf-undersurface nor the very small flowers of *F. litseifolium* (*King*) *Merr.*, with which it was originally compared.

**Oxymitra biglandulosa** (*Bl.*) *Scheff.* in NTNI. 31, 341 (1870).

*Guatteria biglandulosa* *Bl.* Fl. Jav. Anon. 102, t.li (1828).

Dulit, secondary forest, under 300 m., 12 Aug., *Richards* 1217 : " Liane on tree 80–90' high ? "

**Drepananthus ramuliflorus** *Maing. ex Hook. f. et Thoms.* in Hook. f. FBI. 1, 56 (1872) ; *Ridley* in SMJ. 1, no. 3, 78 (1913) ; *Ridl.* FMP. 1, 38.

Dulit, rocky primary (?) forest in valley, under 300 m., 10 Aug., *Richards* 1187 : " Said to be a common species. Slender tree. Height 150 ft. [45 m.]. Circumference at breast height 86" [2.15 m.]. Slightly buttressed. Bark very thin, not longitudinally fissured, smooth. Wood hard, white. Medullary rays in bark conspicuous."

Vernacular names : *selaut* (Malay), *kametan* (Sebop), *detan* (Kenyah).

**Drepananthus carinatus** *Ridley*, FMP. 1, 38 (1922) ; *Henderson* in Gard. Bull. Str. Settle. 4, 213, 215 (1928).

var. **deltoideus** *Airy-Shaw*, var. nov. sepalis minoribus triangularibus 4–5 mm. tantum latis, foliis subtus brevius spariusque pubescentibus distincta.

Dulit, primary forest on hillside, under 300 m., 15 Aug., *Richards* 1282 : " Tree, 58 ft. [17.4 m.] high. Diam. 2 ft. [0.6 m.] from ground, 14 inches [0.35 m.]. No buttresses. Branching about 7 ft. [2.1 m.] from top. Bark smooth, yellowish. Fls. with sickly sweet scent. Petals creamy yellow (green when young)."

Vernacular name : *selemoh*.

Dulit Ridge, " transition " forest, c. 1200 m., 9 Sept., *Syngé* 1651 : " Tree, c. 15 m. high. Diameter c. 14 cm. Bark smooth. Has gum. Sap said to be good to drink when tree is not in flower."

Vernacular name : *selemoh gunong*.

In size and shape of leaves and petals this is indistinguishable from *Ridley's* species, but further material may show the desirability of treating it as specifically distinct. I follow *Henderson* (l.c. supra)



in maintaining the genus *Drepananthus*, as the case for its reduction to *Cyathocalyx* does not appear to be conclusively proved.

A feature of *Drepananthus* species, to which I have not seen attention drawn, is that they afford unusually good examples of sympodial branching. The branchlets are stout and almost straight, and the leaf-opposed inflorescences arise along them on alternate sides with the greatest regularity. *Richards* 1282 shows this very clearly.

**Artabotrys suaveolens** (Bl.) Bl. Fl. Jav. Anon. 62, tt. xxx, xxxi D (1828) ; Ridley in SMJ. 1, no. 3, 76 (1913).

*Unona suaveolens* Bl. Bijdr. 17 (1825).

Dulit, secondary forest, under 300 m., 14 Aug., *Richards* 1258 : "Large liane on trees, 30–40 ft. [9–12 m.] high. Perianth segments pale green when young, cream coloured when mature. Fls. sweet scented."

**Popowia tomentosa** Maing. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 70 (1872) ; ? Ridley in SMJ. 1, no. 3, 87 (1913), cf. Merr. in Journ. Roy. As. Soc. Str. Br. spec. no. 265 (1921).

Dulit, primary forest on crest of ridge, under 300 m., 29 Oct., *Richards* 2360 : "Tree, 18 m. high, 15 cm. diam. No buttresses. Petals pale pinkish."

Vernacular name : *medang kasap*.

**Mitrephora glabra** Scheff. in Ann. Jard. Bot. Buitenz. 2, 20 (1885) ; Ridley in SMJ. 1, no. 3, 86 (1913) ; Diels in Mitt. Inst. Bot. Hamb. 7, 80 (1927).

Sungei Balapau, R. Tinjar, bank of small river, secondary forest, under 300 m., 15 Oct., *Richards* 2223 : "Tree, c. 6–8 m. high, but trunk relatively thick. Fls. with strong sickly sweet scent. Outer perianth segments bright yellow, inner with yellowish 'claw' and purplish expanded portion, externally with pale border, internally marked with dark purple streaks. Inner perianth segments joined at tips. Leaves thinnish, slightly rough."

**Pseuduvaria calliura** Airy-Shaw, sp. nov., *P. caudatae* Merr. ut videtur proxima, a qua foliis duplo majoribus supra haud nitentibus, floribus duplo minoribus, staminibus subduplo paucioribus differt.

*Frutex* circiter 3 m. altus. *Ramuli* graciles, usque 4 mm. diametro, cortice fusco longitudinaliter reticulato-striato dense minute cinereo-tomentello. *Folia* elliptico-oblongata, 20–26 cm. longa, 6.5–7.5 cm. lata, basi angustato-subrotundata, apice abrupte longe tenuiter caudata, cauda 4.5–5.5 cm. longa basi 5 mm. lata apice obtuso 1 mm. lata, papyracea, fusco-cinerea, costa nervisque exceptis glabra ; nervi laterales 12–15-jugi, graciles, supremis exceptis subrecti, prope marginem arcuato-anastomosantes, supra leviter impressi, subtus prominentes, utrinque ut costa cinereo-tomentelli ; petioli crassiusculi, 6–8 mm. longi, 2.5 mm. diametro, cinereo-tomentelli. *Inflorescentiae* axillares, fasciculares, pauciflorae.

*Flores masculi* (? an maturi) pusilli, pedicellis gracilibus 5–6 mm. longis cinereo-puberulis medio minute 1- vel 2-bracteolatis. *Sepala* ovato-deltoidæa, vix 1 mm. diametro, parce puberula. *Petala exteriora* sepalis similia sed subduplo majora. *Petala interiora* rhomboidea, unguiculata, circiter 4 mm. longa et 3 mm. lata, cinereo-tomentella. *Stamina* 20–25, vix 1 mm. longa, connectivis truncatis. *Flores feminei et fructus* ignoti.

Dulit, by stream in primary forest, under 300 m., 31 Aug., Richards 1571: "Shrub, c. 3 m. high."

Well characterized by the long slender abrupt drip-tip. The small size of the flowers (male only present) may possibly be due to youth. The writer fully endorses Merrill's views in PJS. 10, 254 (1915) regarding the distinctness of the genus *Pseuduvaria*. See also Merrill in Contrib. Arn. Arb. 8, 60 (1934).

*Disepalum grandiflorum* Ridley in KB. 1912, 384, et in SMJ. 1, no. 3, 83 (1913); Merr. in Contrib. Arn. Arb. 8, 59 (1934).

Marudi, edge of road in "heath" (white sand) forest, under 300 m., 25 July, Richards 1007: "Shrub, c. 2 m. high."

It seems probable that the genus *Disepalum* is related to *Polyalthia*. The foliage, terminal long-pedicelled flower, calyx-texture, and very numerous long-stalked fruiting carpels of all the species are strongly reminiscent of *Polyalthia pulchra* King. The recently described Sumatran *D. platypetalum* Merr. (l.c. 58) may be compared, in its hexamerous sympetalous corolla, with *Papualthia*.

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### XXXIII—NOTES ON THE NOMENCLATURE OF CERTAIN RUTACEAE-AURANTIOIDEAE. H. K. AIRY-SHAW.

#### I. *Limonia monophylla* Linn. and *Atalantia monophylla* DC.

No fewer than five distinct species of *Rutaceae-Aurantioideae*, belonging to five closely related genera (four of them sections of one genus in Engler's treatment), have had the epithet *monophylla*, for various reasons, applied to them.

*Limonia monophylla* L. Mant. Alt. 237 (1771).

*Atalantia monophylla* DC. Prodr. 1, 535 (1824).

*Triphasia monophylla* DC. l.c. 536 (1824).

*Paramignya monophylla* Wight, Ill. Ind. Bot. 1, 109 (1840).

*Severinia monophylla* Tanaka, Stud. Citrol. 1, 95 (1928).

Of these, the third and fourth were proposed quite independently of *Limonia monophylla* L., and need not concern us further; they are mentioned here in order that they may not be confused with the species with which we are particularly dealing in this paper.

The confusion here has already been commented on, and to a great extent unravelled, by Burkill in Gard. Bull. Str. Settlm. 5, 215 (1931), and the ensuing remarks are an attempt to clarify the situation, if possible, further and to follow Burkill's remarks to their logical conclusion.

*Limonia monophylla* L. was explicitly based upon *Limones "pusilli"* [i.e. *pumili*] *Zeylanici sylvestres* Burm. Thes. Zeyl. 143,

t. 65, fig. 1 (1737). Burman's description and figure were based on a plant in Hermann's herbarium, listed as *Dehighaha* in the latter's Mus. Zeyl. ed. 2, 40 (1726). Trimen examined Hermann's specimen and wrote of it in his flora (Handb. Fl. Ceyl. 1, 227: 1893) as follows: "The figure of Burman (a very poor one) appears to represent this [*Atalantia ceylanica* (Wight) Oliv.] rather than *A. monophylla*, to which it is referred in Fl. B. Ind. and elsewhere; this is therefore *Limonia monophylla*, L. Hermann's specimen, however, is described by Linnaeus (Fl. Zeyl. n. 406) under the name of *Phantis*, a name never afterwards referred to in his later works; it is certainly *A. zeylanica*."

In view of this statement, which there seems no reason to doubt (though Hermann's specimen, which the writer has examined at the British Museum, is a poor one), Tanaka's interpretation of the Linnaean species as the South Chinese and Tonkin *Severinia buxifolia* (Poir.) Ten., on the basis of the undetermined specimens of the latter in the Linnaean herbarium (see below, p. 292), is indefensible. *Limonia monophylla* L. is clearly the Ceylon endemic known as *Atalantia ceylanica* (Wight) Oliv.

Burkill (l.c. 216) writes: "obviously the Ceylon plant has a right to the name [*A. monophylla*]." But the name *Atalantia monophylla* was proposed by De Candolle (l.c. *supra*) expressly for the plant figured by Roxburgh, Corom. Pl. 1, 60, t. 83 (1795), as *L. monophylla* L. (which it unfortunately was not). De Candolle, however, did not cite *Limonia monophylla* L. under *Atalantia monophylla*, and it seems probable, from his total omission of *L. monophylla* from the Prodrômus, that he regarded it as a *species omnino dubia*. *Atalantia monophylla* DC. was therefore a new name for Roxburgh's misidentified species, not a new combination based indirectly on *Limonia monophylla* L. (The epithet *monophylla* was presumably retained by De Candolle because it was appropriate.) The epithet *monophylla* (L.) cannot therefore be used for *A. ceylanica* (Wight) Oliv., since this would create a later homonym of *A. monophylla* DC., which was based on a different type; but *monophylla* (L.) would be the correct epithet for *A. ceylanica* in *Rissoa* Arn. or *Sclerostylis* Bl., should either of those genera be revived.

Roxburgh's species was subsequently described by Willdenow, Linn. Sp. Pl. ed. 4/5, 2, 554 (1799), as *Trichilia spinosa*, and again, independently, by Blume, Bijdr. 1, 134 (1825)—a year after De Candolle—as *Sclerostylis spinosa*. Unaware of Willdenow's plant, Koorders transferred Blume's species to *Atalantia* in 1912; thus Tanaka's and Alston's transference of Willdenow's species to the same genus in 1930 and 1931 resulted in a later homonym, which is of course inadmissible. The valid name under *Atalantia* for the species which has been called *A. spinosa* is therefore *A. monophylla* DC.

The tangled synonymy of these species may now be set out as follows:



***Atalantia monophylla* DC.** Prodr. **1**, 535 (1824).

*Limonia monophylla* L. sec. Roxb. Corom. Pl. **1**, 60, t. 83 (1795), non L.

*Trichilia spinosa* Willd. Linn. Sp. Pl. ed. 4/5, **2**, 554 (1799).

*Sclerostylis spinosa* Bl. Bijdr. **1**, 134 (1825).

*Atalantia spinosa* (Bl.) Koord. Exkursjonsfl. J̄ava, **2**, 427 (1912).

*Atalantia spinosa* (Willd.) Tanaka in Journ. Bot. **68**, 232 (1930); Alston, Trim. Handb. Fl. Ceyl. **6**, 38 (1931) (ut videtur de novo); nom. illegit.

***Atalantia ceylanica* (Arn.) Oliv.** in Journ. Linn. Soc. **5**, Suppl. **2**, 25 (1861); Trimen, Handb. Fl. Ceyl. **1**, 227 (1893) ("zeylanica").

*Limonia monophylla* L. Mant. Alt. 237 (1771).

*Rissoa ceylanica* Arn. in Act. Acad. Nat. Cur. **18**, 324 (1836).

*Sclerostylis ceylanica* (Arn.) Wight, Ill. Ind. Bot. **1**, 109 (1840).

*Severinia monophylla* Tanaka, Stud. Citrol. **1**, 95 (1928); Bull. Mus. Hist. Nat. [Par.] sér. **2**, **2**, 163 (Apr. 1930); Journ. Bot. **68**, 232 (Aug. 1930), q.v.; quoad syn. *Limonia monophylla* L. tantum.

A few words may be added regarding Merrill's synonymy and discussion under *Atalantia buxifolia* (Poir.) Oliv., in his Commentary on Loureiro's "Flora Cochinchinensis" (Trans. Amer. Philos. Soc. n.s. **24** (2), 223: 1935). On the basis of Tanaka's statement that the specimens of *Limonia monophylla* in the Linnaean herbarium are *Severinia buxifolia*, Merrill gives the Linnaean species as a synonym of *Atalantia buxifolia*. But, as he points out, the Linnaean specimens (*vide* Jackson) are not authentically named,\* and therefore cannot be taken as the type of the species. *Limonia monophylla* L. must certainly be interpreted on the basis of the Burman synonym, and Hermann's specimen is therefore the type. The citation of *L. monophylla* L. Mant. must accordingly be deleted from the synonymy of *Severinia buxifolia*.

By a slip, Merrill states that *L. monophylla* was published in Linnaeus's "Mantissa **1**: 237. 1767;" it was, of course, published in the "Mantissa Plantarum Altera."

The citation "*Atalantia monophylla* (Roxb.) DC." (Merrill, l.c.) is misleading. It is true that *A. monophylla* DC. "was based wholly on *Limonia monophylla* [L. sec.] Roxb.," but Roxburgh did not publish the latter as a new species: he thought he was dealing with Linnaeus's plant, for he wrote "LIMONIA MONOPHYLLA. Linn. Mant. 237." Roxburgh's misidentification of *Limonia monophylla* L. cannot be treated as a new name, and therefore no new combinations can be based upon it. The citation of Roxburgh should be given in the form "*Limonia monophylla* L. sec. Roxb. . . ., non

\* The writer has examined the Linnaean specimens, identified (no doubt correctly) by Tanaka with *Severinia buxifolia*. There is no evidence whatever to justify their being regarded as the type of *Limonia monophylla* L., or even to connect them with that species at all. They are not so determined by Linnaeus, and may well have been received after that species was described.

L.," and De Candolle's new name must be kept for the plant actually described by Roxburgh, Correa and De Candolle, i.e. for the species commonly known as *Atalantia spinosa* (Bl.) Koord.

## II. *Limonia* Linn. versus *Feronia* Correa.

Swingle, in his article on the name of the wood-apple (Journ. Wash. Acad. Sci. **4**, 325 : 1914), has argued that the generic name *Limonia* L. is invalid, "being a mere variant of *Limonium*." He accordingly uses the next available name, *Feronia* Correa, and has been followed by other authors, including Tanaka and Engler.

But according to Art. 70 (International Rules, ed. 3, 22 : 1935), "when the difference between two generic names lies in the termination, these names must be regarded as distinct, even though differing by one letter only." Among the "examples of different names" given in the Rules (l.c. 23) are *Peponia* and *Peponium*, from which it logically follows that *Limonia* and *Limonium* are also different. The chance of confusion between maritime herbs of the temperate zone and a tree of tropical India, in two totally unrelated families such as *Plumbaginaceae* and *Rutaceae*, is practically nil. It is in any case desirable, in the interests of historic continuity, to preserve Linnaean generic names whenever possible. There is, therefore, no justification, under International Rules, for rejecting *Limonia* L. in favour of the much later *Feronia* Correa.

The genus is monotypic, being restricted to the species originally described by Linnaeus.

***Limonia* L.** Gen. Pl. ed. 6, 213 (1764).

*Feronia* Correa in Trans. Linn. Soc. **5**, 224 (1800) ; Engl. in Engl. et Prantl, Nat. Pflanzenfam. ed. 2, **19a**, 354 (1931).

*Anisifolium* Rumpf ex Kuntze, Rev. Gen. Pl. **1**, 98 (1891).

***L. acidissima* L.** Sp. Pl. ed. 2, 554 (1762) ; Alston, Trim. Handb. Fl. Ceyl. **6**, 41 (1931).

*Schinus Limonia* L. Sp. Pl. ed. 1, 389 (1753).

*Feronia elephantum* Correa, l.c.

*Hesperethusa acidissima* (L.) M. Roem. Syn. Monogr. **1** (Hesper.), 38 (1846).

*Anisifolium Limonia* (L.) Kuntze, l.c.

*Feronia Limonia* (L.) Swingle in Journ. Wash. Acad. Sci. **4**, 325, 328 (1914) ; Engl. in Engl. et Prantl, l.c. 355.

It is a matter for regret that certain modern authors such as Haines, Bot. Bihar and Orissa, 163 (1921), Craib, Fl. Siam. Enum. **1**, 229 (1926), etc., have persisted in the use of the name *Limonia acidissima* for *Hesperethusa crenulata* (Roxb.) M. Roem., in spite of the fact that the incorrectness of this was pointed out by Swingle (in Bailey, Stand. Cyclop. Hort. **3**, 1478) as long ago as 1915. It is to be hoped that the authors of future floras will use the correct nomenclature for this confused group.

**XXXIV—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS* : XXII.\*** E. M. MARSDEN-JONES AND W. B. TURRILL.

**FURTHER RESEARCH ON THE GENETICS OF PETAL SIZE AND OTHER CHARACTERS IN *S. MARITIMA*.**

In K.B. 1933, 357 seq., we described genetical research with a plant of *S. maritima* which had very poorly developed petals (see l.c. plate 16). The series of intraspecific crosses there analyzed were made by crossing a narrow-leaved plant, S.P.5, with a broader-leaved plant (A.13). It was felt desirable to test petal size by selfing further  $F_1$  plants obtained by breeding together two broader-leaved plants, one with normal and one with poorly developed petals.

The following scheme shows the series of families described here :

	A. 2 × A. 13	
$F_1$	N. 36	
$F_2$	N.107=N.36 plant 8 selfed.	54 plants.
	N.109=N.36 plant 5 selfed.	79 plants.
	N.118=N.36 plant 15 selfed.	90 plants.

A.2 was described in K.B. 1928, p. 4. A.13 was described in K.B. 1929, p. 150 and the results of selfing this stock-plant in K.B. 1933, pp. 357-8, where a family (N.68) from a sib of the  $F_1$  plants used to produce the three families described below is analyzed.

**$F_1$  FAMILY.**

**N.36.** 44 plants in the family.

*Habit* : prostrate, uniform, stems up to 3.2 dm. long, with little anthocyanin.

*Leaves* : lanceolate to oblanceolate-linear.

*Inflorescence* : with from 3 to 7 flowers, which are erect and actinomorphic.

*Calyx* : fluctuated from cylindric to broadly ellipsoid (even on the same plant, No. 5) ; Nos. 8 and 15 were cylindric. Much anthocyanin.

*Corolla* : all with fully developed petals, petals and segments overlapping, excepting segments divergent in No. 23, all bilobed, lobed three-quarters, with good scales, 12 with blotch : 32 with no blotch.

*Androecium* : 19 with purple filaments : 18 with white filaments ; anthers all purple ; 26 with hermaphrodite flowers only : 11 with hermaphrodite and female flowers : 7 with female flowers only.

*Gynoecium* : stigmata 29 purple : 15 white ; immature seeds all purple.

*Fruits* : 24 broadly ovoid : 14 obloid : 4 fluctuating.

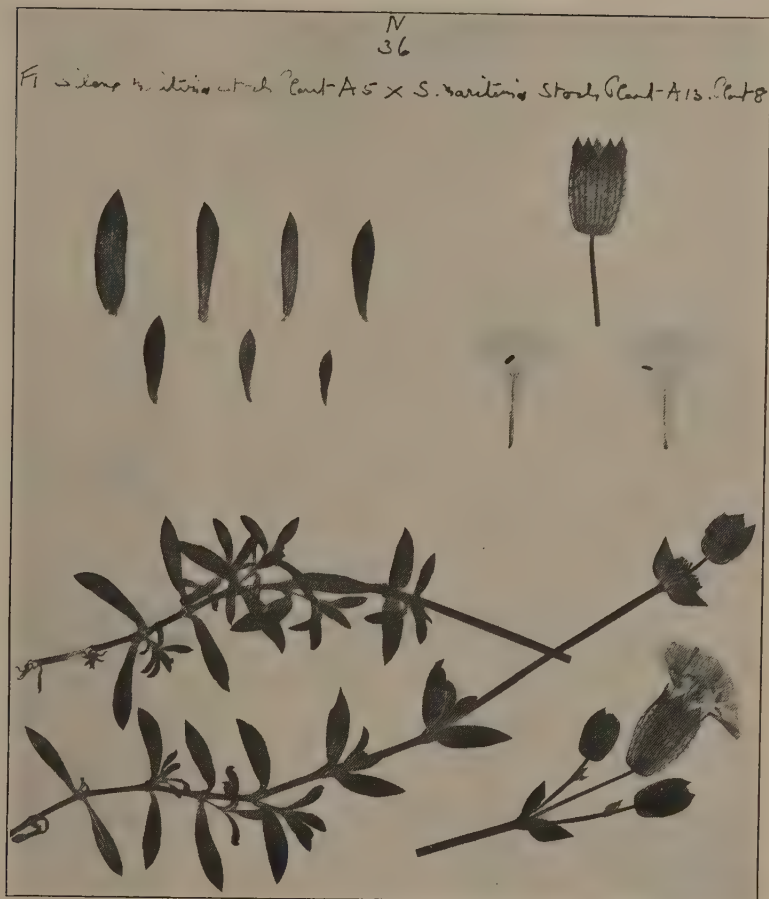
*Seeds* : all armadillo.

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\* Continued from K.B. 1938, 254.



PLATE II



Card material of *Silene maritima* N.36, plant 8 ( $F_1$  family stock plant A.5 x stock plant A.13).



# CHARACTERS OF F<sub>1</sub> PLANTS SELFED.

*Plant 5*: calyx shape fluctuating; no blotch; purple filaments; hermaphrodite and female flowers; stigmata purple; fruits obloid.

*Plant 8*: calyx cylindric; blotch present, purple filaments; hermaphrodite flowers; stigmata purple; fruits broadly ovoid.

*Plant 15*: calyx cylindric; blotch present, purple filaments; hermaphrodite flowers; stigmata purple; fruits broadly ovoid.

## F<sub>2</sub> FAMILIES.

*Habit*: prostrate, uniform.

*Leaves*: uniformly of typical *S. maritima* type.

*Anthocyanin in vegetative parts*: medium.

*Anthocyanin in calyx*:

		Very much.	Much.	Medium.	Little.	None.
N. 107	...	0	42	11	0	0
N. 109	...	0	55	18	2	0
N. 118	...	0	60	27	0	0

*Calyx shape*:

		Ellipsoid.	Narrow ellipsoid.	Cylindric.	Fluctuating.
N. 107	...	0	33	12	8
N. 109	...	2	45	6	22
N. 118	...	1	52	7	27

*Corolla*: petals all with well-developed scales.

		Petals bilobed.	Petals multi-lobed.	Petals 2/3 lobed.	Petals 3/4 lobed.	Petals fully developed.	Petals poorly developed.
N. 107	...	46	0	14	29	33	21
N. 109	...	67	9	3	71	64	15
N. 118	...	77	1	1	77	76	14
Totals	...	190	10	18	177	173	50

		Petals overlap.	Petals diverge.	Segments overlap.	Segments diverge.	Blotch	No blotch.
N. 107	...	28	16	26	18	40	5
N. 109	...	64	11	50	25	0	76
N. 118	...	74	5	68	11	7	70
Totals		166	32	144	54	47	151

*Androecium and sex :*

	Anthers purple.	Anthers yellow- green.	Fila- ments purple.	Fila- ments white.	Flowers herma- phrodite.	Flowers herma- phrodite and female.	Flowers female.
N. 107	25	0	17	8	15	11	26
N. 109	13	0	8	5	3	10	62
N. 118	33	0	22	11	15	18	55
Totals	71	0	47	24	—	—	—

*Stigmata and immature seed colour :*

	Sitgmata purple.	Stigmata white.	Immature seeds purple.	Immature seeds white.
N. 107 ... ..	37	15	48	0
N. 109 ... ..	52	25	76	0
N. 118 ... ..	64	24	84	0
Totals ...	153	64	208	0

*Fruits and seeds :*

	Broadly ovoid.	Obloid.	Tubercled.	Armadillo.
N. 107 ... ..	43	11	0	54
N. 109 ... ..	0	76	0	76
N. 118 ... ..	41	31	0	72
Totals ...	—	—	0	202

DISCUSSION.

*Calyx* : The parent A.2 had much, A.13 a small amount of anthocyanin. The F<sub>1</sub> had much and the F<sub>2</sub> families gave the figures 0 very much : 157 much : 56 medium : 2 little : 0 none. This is practically a 3 : 1 ratio.

The fluctuation for calyx shape in F<sub>1</sub> and F<sub>2</sub>, both between and on individual plants, was greater than in any other families within our experience. It is possible that modifiers functioning independently of the ordinary genome are responsible.

*Corolla* : 10 plants in F<sub>2</sub> showed some petals (usually very few per plant) multilobed.

There was a considerable range in degree of petal development in F<sub>2</sub> plants. In extreme poorness of lamina development the lobing was two-thirds and the petals and segments did not overlap. Fully developed to more or less poorly developed gave, for the three F<sub>2</sub> families together, 173 : 50, which approximates to 3 : 1. It should be noted that female flowers usually have smaller petals than



hermaphrodite ones and this in turn tends to modify lamina depth of lobing and lobe overlapping. In this series of families, poor petal development did not affect the development of coronal scales.

$F_1$  segregated for blotch. In  $F_2$  the families showed very different segregations: N.107, derived from an  $F_1$  plant with a blotch, gave a ratio of 8 present : 1 absent; N.109, derived from an  $F_1$  plant without a blotch, had all plants without a blotch; N.118, derived from an  $F_1$  plant with a blotch, gave a ratio of 1 present : 10 absent. It is certain that several factor pairs (possibly including inhibitors) are involved.

*Filaments*: A.2 had purple filaments (in the few stamens produced); A.13 had white filaments;  $F_1$  showed 1 : 1 segregation; all  $F_2$  plants selfed had purple filaments; the  $F_1$  families show a 2 : 1 segregation. Owing to the high proportion of female flowers these figures cannot be further explained at present.

*Sex*: A.2 was female (except for the production of relatively few stamens); A.13 was hermaphrodite.  $F_1$  and  $F_2$  families segregated for sex. It is interesting to note the low proportion of hermaphrodites and high proportion of females in N. 109, an  $F_2$  from an immediate selfed parent which produced both hermaphrodite and female flowers.

*Stigmata colour*: A.2 had purple and A.13 white stigmata;  $F_1$  gave 2 purple : 1 white; all  $F_1$  plants selfed to produce  $F_2$  families had purple stigmata;  $F_2$  total ratio was 2.4 purple : 1 white.

*Capsule shape*: N. 36 plant 5 bred true to obloid capsules; N.36 plant 8 and N.36 plant 15, both with broadly ovoid capsules, segregated on selfing in the ratios 4 broadly ovoid : 1 obloid and 1.26 broadly ovoid : 1 obloid, respectively.

*Uniform behaviour* occurred for the following in  $F_1$ , and all  $F_2$  families: habit, leaf-shape, coronal scales, anther colour, immature seed colour, and armadillo testa.

#### SUMMARY.

Two broad-leaved plants of *Silene maritima* were crossed together, the one with fully developed normal petals, the other with poorly developed petals. Three  $F_2$  families were raised, totalling 223 plants. Petal size is shown to have a monohybrid genetical basis, in agreement with earlier results, when a narrow-leaved variety was crossed with the same broad-leaved poor-petalled plant. It is obvious that the narrow-leaved character of the second parent does not influence the genetic inheritance of petal size. Other characters scored were: habit, leaf-shape, anthocyanin in vegetative and floral parts, calyx-shape, petal lobing and overlapping, corona, sex, fruit-shape, and testa structure.

The research on which this paper is based has been aided by a Royal Society Government Grant.

**XXXV—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXIII.** E. M. MARSDEN-JONES AND W. B. TURRILL.

GENETICS OF CALYX-SHAPE AND OTHER CHARACTERS IN *S. MARITIMA*.

Calyx shape within the species *S. maritima* and *S. vulgaris* shows a wide range of variation. It is often difficult to score because of the occurrence of all grades of intermediates, between markedly different extremes, and sometimes of fluctuation on an individual plant. An extreme variant with long cylindric calyces was found in a wild population and has been used in various crosses, of which one is considered here.

The following is the key to the families described below :

N.104=*S.P.70* selfed.

N.106=*N.36* plant 15  $\times$  *S.P.70*.

N.220=*N.106* plant 7 selfed.

N.222=*N.106* plant 45 selfed.

*N.36* plant 15 is described in pp. 294-297.

DESCRIPTION OF STOCK-PLANT 70.

Collected on Chesil Beach, Dorset, Abbotsbury end, 1932.

*Habit* : compact and ascending, stems up to 4.7 dm., anthocyanin in vegetative parts much.

*Leaves* : linear to oblanceolate-linear, well-developed leaf 2.5 cm. long, 0.4 cm. broad.

*Inflorescence* : of 1 to 3 (rarely 5) flowers.

*Calyx* : Long cylindric, 2.6 cm. long, 0.8 cm. in diameter, narrowing downwards in fruit, with medium anthocyanin.

*Corolla* : white petals only slightly protruding from mouth of calyx, the laminae together giving a fruit-bowl shape, natural diameter 2.0 cm., when artificially spread out 2.9 cm. diameter ; petals 2.7 cm. long, 1.2 cm. broad, multilobed,  $\frac{3}{4}$  lobing, when fully spread out the segments and petals did not overlap, but with the natural bowl-shape the petals were mostly more or less discontinuous and the segments were overlapping or contiguous ; no anthocyanin blotch ; corona of small scales.

*Androecium* : fully functional, flowers hermaphrodite ; anthers purple ; a trace of anthocyanin in the filaments.

*Gynoecium* : stigmata purple ; immature seeds purple.

*Ripe capsules* : broadly ovoid, 8 mm. long (without teeth), 7 mm. diameter (in broadest part below middle), teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at base, strongly recurved.

*Seeds* : armadillo.

**N.104.** *S.P.70* selfed. 126 plants in the family.

*Habit* : uniform, all compact and ascending ; anthocyanin in vegetative parts much.

*Leaves* : uniform, and as parent.

*Inflorescence* : of 1 to 3 (rarely 5) flowers.

*Calyx* : uniform, long cylindric, with medium anthocyanin.

*Corolla* : petals overlapping or contiguous 51 : petals not overlapping or contiguous 68 ; segments overlapping or contiguous 89 : segments not overlapping or contiguous 30 ; petals multilobed 122 : petals bilobed 2 ; all  $\frac{3}{4}$  lobed ; all with small scale ; all except 1 without anthocyanin blotch.

*Androecium* : 104 with anthers purple ; filaments 72 white : 32 purple.

*Sex* : 75 with hermaphrodite flowers only ; 29 with hermaphrodite and female flowers ; 20 with female flowers only.

*Gynoecium* : stigmata 41 white : 83 purple ; immature seeds all purple.

*Ripe capsules* : all broadly ovoid.

*Seeds* : all armadillo, in one plant there was a slight roughing on the back of some of the seeds.

**N.106.** N.36 plant 15 × S.P.70. 103 plants in the family.

*Habit* : uniform and intermediate between parents ; anthocyanin in vegetative parts 80 much : 23 medium.

*Leaves* : intermediate between parents.

*Inflorescence* : of 1 to 3 (rarely 5) flowers.

*Calyx* : no long cylindric calyces appeared, i.e., none of S.P.70 shape, but the calyces ranged from cylindric to ellipsoid, often on the same plant, 3 plants had definitely ellipsoid calyces and 11 definitely cylindric (not long cylindric), the remaining 89 had intermediate or fluctuating calyces ; anthocyanin medium in all.

*Corolla* : petals overlapping or contiguous 103 : petals not overlapping or contiguous 0 ; segments overlapping or contiguous 81 : segments not overlapping or contiguous 22 ; petals multilobed 7 : petals bilobed 96 ; all  $\frac{3}{4}$  lobed ; scale 101 : small scale 2 ; anthocyanin blotch present 34 : absent 69.

*Androecium* : 101 with anthers purple ; filaments 27 white : 74 purple.

*Sex* : 90 with hermaphrodite flowers only ; 11 with hermaphrodite and female flowers ; 2 with female flowers only.

*Gynoecium* : stigmata 43 white : 60 purple ; immature seeds all purple.

*Ripe capsules* : broadly ovoid 79 : intermediate 24.

*Seeds* : all armadillo.

**N.220.** N. 106 plant 7 selfed. 67 plants in the family.

*Habit* : all typical *S. maritima* ; stems ascending 20 : intermediate 44 : prostrate 3 ; anthocyanin in vegetative parts 39 much : 28 medium.

*Inflorescence* : of 1 to 3 (rarely 5) flowers.

*Calyx* : shape was more definite than in F<sub>1</sub> ; ellipsoid 27 : intermediate 36 : cylindric 2 : long cylindric 2 ; anthocyanin in calyx much 31 : medium 36.

*Corolla* : petals overlapping or contiguous 46 : petals not overlapping or contiguous 21 ; segments overlapping or contiguous 23 : segments not overlapping or contiguous 44 ; petals all bilobed ;  $\frac{3}{4}$  lobed 55 :  $\frac{2}{3}$  lobed 12 ; scale 64 : small scale 3 ; anthocyanin blotch present 4 : absent 63.

*Androecium* : 67 with anthers purple ; filaments white 11 : purple 56.

*Sex* : all hermaphrodite.

*Gynoecium* : stigmata 61 white : 6 purple ; immature seeds all purple.

*Ripe capsules* : obloid 6 : intermediate 33 : broadly ovoid 26.

*Seeds* : all armadillo.

**N.222.** N.106 plant 45 selfed. 69 plants in the family.

*Habit* : all typical *S. maritima* ; stems ascending 6 : intermediate 38 : prostrate 25 ; anthocyanin in vegetative parts, much 2 : medium 42 : little 25.

*Inflorescence* : of 1 to 3 (rarely 5) flowers.

*Calyx* : shape was more definite than in  $F_1$  ; ellipsoid 0 : intermediate 39 : cylindric 30 ; anthocyanin in calyx, much 37 : medium 32.

*Corolla* : petals overlapping or contiguous 68 : petals not overlapping or contiguous 1 ; segments overlapping or contiguous 22 : segments not overlapping or contiguous 47 ; petals multilobed 12 : bilobed 57 ;  $\frac{3}{4}$  lobed 64 :  $\frac{2}{3}$  lobed 5 ; scale 68 : small scale 1 ; anthocyanin blotch present 29 : absent 40.

*Androecium* : 58 with anthers purple ; filaments white 0 : purple 58.

*Sex* : hermaphrodite flowers only 51 : hermaphrodite and female flowers 7 : female flowers only 11.

*Gynoecium* : stigmata, white 11 : purple 58 ; immature seeds all purple.

*Ripe capsules* : broadly ovoid 45 : intermediate 24 : obloid 0.

*Seeds* : all armadillo.

#### DISCUSSION.

*Habit* : a plant with prostrate stems was crossed with a plant with ascending stems and gave an  $F_1$  intermediate in habit. Since the original plants bred true for habit the different ratios in  $F_2$  are difficult to explain. These are ascending 20 : intermediate 44 : prostrate 3 and ascending 6 : intermediate 38 : prostrate 25. It may be that the  $F_1$  was heterozygous for lethals which affected habit ratios in  $F_2$ .

*Anthocyanin in vegetative parts* : all plants in the series had some anthocyanin. There is no doubt that not only presence or absence but also intensity of coloration has a genetic basis. A plant with little anthocyanin was crossed with a plant with much.  $F_1$  segregated into much and medium and the  $F_2$  families came from plants with much and medium respectively. The former gave an  $F_2$  of much 39 : medium 28 and the latter much 2 : medium 42 :



little 25. Two, or possibly three, factors with a cumulative result are presumably involved.

*Calyx*: a plant with cylindric calyces was crossed with a plant with peculiar long cylindric calyces. The former plant segregated on selfing into ellipsoid, narrow ellipsoid, cylindric, and fluctuating, while the latter bred true for calyx shape. The  $F_1$  showed segregation into ellipsoid, intermediate, and cylindric. An  $F_2$  family from an  $F_1$  with ellipsoid calyces gave ellipsoid 27 : intermediate 36 : cylindric 2 : long cylindric 2. An  $F_2$  family from an  $F_1$  with cylindric calyces gave ellipsoid 0 : intermediate 39 : cylindric 30 : long cylindric 0. Ellipsoid throws a majority of ellipsoid and intermediate, and cylindric only intermediate and cylindric. The very few long cylindric plants in  $F_2$  (2 out of 136) and the fact that none of these came from a cylindric  $F_1$  suggests that long cylindric is in some sense a bottom recessive for the factor group involved and particularly that the presence of a factor for cylindric prevents its expression or at least its full expression.

All plants in the series had much or medium anthocyanin in the calyces. Between "much" and "medium" there is no sharp line of demarcation and the character expression is easily modified by environmental conditions. The spring drought of 1938 probably increased the depth of colour and was the cause of the higher number of plants with "much" anthocyanin in the  $F_2$  families—much 76 : 60 medium.

*Corolla*: the exceptional difficulty of scoring for overlapping of petals and segments in flowers with long cylindric calyces has been noted above. One parent also segregated on selfing for poorly developed petals. There is thus a good deal of interference with the normal expression of these characters. The parents had overlapping and more or less not overlapping petals and segments respectively.  $F_2$  families segregated in different ratios, which, however, while showing higher figures where expected, suggest considerable interference from factors having a modifying influence upon the expression of those genes which are sometimes clearly responsible for overlapping or its absence.

The ovule parent had bilobed petals, the pollen parent had very many petals multilobed. On selfing the former bred practically true to "multilobed"—102 multilobed : 2 bilobed. It must be noted that by "multilobed" is meant that *at the time of scoring* one or more petals, in flowers then at full anthesis, show clearly one or more extra lobes. Very rarely are all the petals multilobed. It follows that some plants scored as "bilobed" may during some part of their often very long flowering period really be "multilobed," i.e., in a segregating family the figure for "bilobed" may be too high and for "multilobed" too low. "Bilobed" is nearly but not fully "dominant" over "multilobed." One  $F_1$  family bred true to "bilobed" and the other segregated in the empirical ratio (of one scoring) of approximately 5 : 1.

The two parents and all  $F_1$  plants showed  $\frac{3}{4}$  lobing. The appearance of a few (17 out of 136) plants with  $\frac{2}{3}$  lobing in the  $F_2$  families is possibly due to genes for poorly developed petals introduced through the ovule parent.

All plants in the series of families had scales. The ovule parent had fully developed scales and the pollen parent small scales. It may be that the latter would have produced fully developed scales had the petals been able to spread normally, which they could not do because of the long cylindric calyces. A very few plants in  $F_1$  and  $F_2$  (6 out of 239) had scales not fully developed, possibly caused by other than genetic factors.

Complementary factors are involved in anthocyanin production, and there are many degrees of development of anthocyanin blotch on petals. The ovule parent had a blotch but segregated on selfing. The pollen parent had no blotch but on selfing produced one plant (out of 126) with a blotch (? a mutation). The  $F_1$  and  $F_2$  families all segregated with the majority of plants not showing blotches.

*Androecium*: anthers were purple in all plants of the series. Both parents had anthocyanin in the filaments, but there was only a trace in the pollen parent.  $F_1$  segregated (74 purple : 27 white). One  $F_2$  bred true to purple filaments from an  $F_1$  with purple filaments and the other, also from an  $F_1$  with purple filaments, segregated (56 purple : 11 white).

*Sex*: Both parents were hermaphrodite but segregated for sex on selfing. The  $F_1$  and one  $F_2$  family segregated for sex and one  $F_2$  family bred true to hermaphroditism.

*Gynoecium*: both parents had purple stigmata but both segregated on selfing. It was noted that in plants in N.104 with both hermaphrodite and female flowers the latter often had purple thicker stigmata while the former had white more slender stigmata.  $F_1$  and  $F_2$  families all segregated. The former approximated to a 9:7 ratio. An  $F_2$  family from an  $F_1$  plant with purple stigmata gave 58 purple : 11 white. An  $F_2$  family from an  $F_1$  plant with white stigmata gave 6 purple : 61 white. Immature seeds were purple in all plants of the series.

*Ripe capsules*: both parents had broadly ovoid capsules. The ovule parent segregated on crossing, the pollen parent bred true on selfing.  $F_1$  segregated for broadly ovoid and intermediate as did also one  $F_1$  family. The second  $F_1$  family segregated into 6 obloid : 33 intermediate : 26 broadly ovoid. The factor or factor-group responsible for obloid ("squat") capsules has certainly come from the ovule parent.

*Seeds*: all plants in the series had armadillo seeds.

#### CALYX SHAPES IN *SILENE MARITIMA*.

Within both *S. maritima* and *S. vulgaris* there is a very great range in calyx shape. There are many difficulties in scoring variants into definite classes but a few well-marked variants are easily recognized. In the course of our studies we have examined many

thousands of plants of both species in or from localities representing most of the geographical and ecological ranges of the species. Extreme variants are rare in nature and in the British Isles are, at least usually, of casual occurrence. In this paper we have used a plant, from the Chesil Beach, which had very long cylindric calyces from which the petals could not properly expand their laminae. Only a single individual was found showing this character, among a very large population, of which some thousands were examined in the course of several visits. This plant (S.P.70) is described above.

In July 1930 on the bank of the R. Ystwyth, south-east of Aberystwyth, and about a mile inland from the mouth, a plant very similar in calyx shape to S.P.70 was found as a single individual amongst a very large population. This plant is now referred to as S.P.55.

**S.P.55.** Bank of R.Ystwyth, Cardiganshire, 13.7.1930.

*Habit* : stems spreading, semi-prostrate below, ascending above (in the wild), up to 3.8 dm. long ; medium anthocyanin in the vegetative parts.

*Leaves* : broadly linear or oblanceolate-linear, apex acute to shortly acuminate, average of well developed leaves 3.5 cm. long, 0.6 cm. broad, margins more or less and often sparsely shortly ciliated.

*Inflorescence* : of 1 to 3 (rarely up to 7) flowers, which are erect at full anthesis and actinomorphic. Bracts glabrous, sparsely or not ciliated, lower green and herbaceous similar to but smaller than uppermost leaves, upper smaller and narrower, the uppermost completely scarious.

*Calyx* : long narrow cylindric, about 2.3 cm. long (including lobes) and 0.5-0.6 cm. diam. at anthesis, somewhat enlarging and broadening in the upper part in fruit, with much anthocyanin.

*Corolla* : with the petals and segments not contiguous or overlapping, included in the calyx and not spreading. Petals mostly poorly developed, 1.8 cm. long, 0.5 mm. broad, white, lamina lobed for one-third to half its length, scales fairly well developed, anthocyanin blotch present.

*Androecium* : rarely developed, but a few stamens occasionally formed in several flowers ; filaments white ; anthers purple.

*Gynoecium* : stigmata white (under cultivation often poorly developed, and flowers may then be more or less neuter) ; immature seeds purple.

S.P.55 was grown at Potterne for four years and then died. During this period it remained absolutely sterile, never setting fruits or seeds with either controlled or open pollination. This appeared to be due to gynoeical degeneration. Wild material is in Herb. Kew. as No. 2044 and cultivated material under S.P.55.

**N.129.** S.P.55  $\times$  S.P.70. No seed set.

N.130. S.P.55 selfed. No seed set.

In open polination the plant had a full chance of receiving pollen from any of thousands of plants of many different stocks.

We suggest that S.P.55 and S.P.70 arose as independent mutations in the wild in widely separated localities. In neither plant was there any reason for supposing previous contamination by *S. vulgaris*.

#### SUMMARY.

An account is given of a plant with long cylindric calyces, and it is shown that this plant breeds true for this and certain other characters. It was crossed with a plant with cylindric calyces and an  $F_1$  and two  $F_2$  families were raised. The characters scored included those for habit, anthocyanin in vegetative and floral parts, calyx shape, petal lobing and overlapping, coronal development, sex, capsule shape, and testa surface. The results obtained are discussed at some length. The long cylindric calyx appears to be a bottom recessive and a factor for normal cylindric especially prevents its expression.

Another plant with similar calyces, but from a widely separated locality, is also described. It proved entirely sterile.

The research on which this paper is based has been aided by a Royal Society Government Grant.

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#### XXXVI—NOTES ON CAREX: VIII.\* E. NELMES.

##### THREE NEW SPECIES FROM LAOS.

Dr. A. F. G. Kerr, as is well known, has made large collections of plants in Siam during many years. In 1932, on his final expedition, he penetrated into Laos and climbed Pu Bia, one of the highest mountains in French Indo-China.

Among his Laos gatherings are four *Carices*, all of which appear to be new to science. Three of them are described below: the fourth is unfortunately in too advanced a stage for adequate description.

This high percentage of new species suggests that the Pu Bia mountain region would repay further exploration.

*Carex Kerrii* Nelmes, sp. nov.; affinis *C. tereti* Boott, sed vaginis foliorum purpureo-sanguineis, spicis paucis brevioribus, utriculis longioribus ovato-lanceolatis paucinervibus differt.

*Culmi* 45–62 cm. alti, acutanguli, inferne laeves, superne scabri, subvalidi, rigidi, foliati, basi vaginis aphyllis paucis purpureo-sanguineis circumdati. *Folia* inflorescentiam superantia, 4–6 mm. lata, planiuscula, valde 3-costata, coriacea, rigida, vaginis basilaribus purpureo-sanguineis. *Spicae* 5–7, fastigiatae, superiores 1–3 gynaeandreae, subsessiles, ceterae femineae, pedunculatae, plerumque 5–7 cm. longae, nutantes, superiores subapproximatae, inferiores subdistantes; pedunculi tenues, parce scabri. *Bractaeae* foliaceae, evaginant, inferiores inflorescentiam longe superantes, superiores

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\* Continued from K.B. 1939, 202.



parvae. *Squamae femineae* ovato-ellipticae, apice obtusae vel subacutae, inferne pallide ferrugineae, superne atro-sanguineae, pallide viridi-carinatae, in mucronem excurrentes. *Utriculi* squamis longiores et latiores, 4-4.5 mm. longi, ovato-lanceolati, plano-convexi, subpatentes, pallide ferruginei, glabri, membranacei, dorso 4-6-nerves, facie tenuiter 3-nerves, in rostrum mediocre subteres laeve ore atro-sanguineum subintegrum sensim desinentes. *Nux* late ovato-elliptica, sublaxe inclusa, breviter et valde stipitata. *Stigmata* 2.

LAOS. Pu Bia, in open patch in evergreen forest, c. 2500 m., 13 April 1932, *Kerr* 21,031 (Kew).

**Carex euprepes** *Nelmes*, sp. nov.; affinis *C. spatiosae* Boott var. *bogorensi* C. B. Clarke, sed foliis multo latioribus late elliptico-lanceolatis dorso nervibus adpresso-hispidulis, utriculis magis curvatis praecipue differt.

*Culmi* 70 cm. alti, stricti, laeves, rigidi, triquetri, foliati, validi, basi vaginis aphyllis paucis inferne pubescentibus circumdati. *Folia* late elliptico-lanceolata, apice acuminata, plerumque 18-21 cm. longa, medio 3.5-3.7 cm. lata, patentia, plana, vaginantia, superiora 1-3 inflorescentiam superantia, supra inferne laevia superne nervis 2 prominentibus scabra, infra nervis adpresso-hispidula. *Inflorescentia* paniculata, elongata, interrupta, 10-15 cm. longa; *paniculae secundariae* suberectae, suboblongae, bracteatae. *Spicae* androgynaeceae, subdivaricatae, 8-10 mm. longae, pauciflorae, pars mascula parti femineae aequilonga. *Bracteae* inferiores late foliaceae, inflorescentiam longe superantes, vaginantes, superiores abrupte minores. *Squamae femineae* parvae, late ovatae, albidae, tenuiter striatae, subacutae, mucronulatae. *Utriculi* squamis multo longiores et latiores, 4-4.5 mm. longi, late elliptico-lanceolati, trigoni, divaricati, laeves, plurinerves, superne anguste marginati, marginibus hispidi, in rostrum sublongum curvum leviter tortum planiusculum marginatum (marginibus hispidulis) ore oblique sectum bidentatum (dentibus strictis) subabrupte contracti. *Nux* arcte inclusa, elliptica. *Stylus* basi bulbosus. *Stigmata* 3.

LAOS. Tawiang, Chiengkwang, evergreen forest, c. 900 m., 6 April 1932, *Kerr* 20,927 (Kew).

Note.—The status and relative position of *C. spatiosa* Boott var. *bogorensis* C. B. Clarke are not yet clearly defined. The plant appears to be more closely related to *C. euprepes* than to *C. spatiosa*, and its identification with *C. Horsfieldii* Boott, by Kükenthal, is certainly erroneous.

**Carex laosensis** *Nelmes*, sp. nov.; affinis *C. euprepi* *Nelmes*, sed foliis multo angustioribus, utriculis majoribus laevioribus, paniculis minoribus angustioribus praecipue differt.

*Culmi* stricti, rigidi, subvalidi, foliati. *Folia* superiora inflorescentiam longe superantia, apice acuminata, 10-13 mm. lata, plana, utrinque laevia sed apicem versus marginibus scabra, vaginantia.

*Inflorescentia* paniculata, anguste oblonga, interrupta, usque 13 cm. longa; *paniculae secundariae* suberectae, oblongae, inferiores bracteatae. *Spicae* subdivaricatae, androgynaeceae vel superiores saepe omnino masculae, pauciflorae, pars mascula parti femineae aequilonga. *Bracteae* foliaceae, inflorescentiam longe superantes, vaginantes. *Squamae femineae* parvae, late ovatae, albiae, tenuiter striatae, mucronulatae. *Utriculi* squamis multo longiores et latiores, 4-4.5 mm. longi, ovato-lanceolati, conspicue trigoni, divaricati, valde marginati, marginibus superne hispiduli, pluri-nerves, in rostrum sublongum curvum leviter tortum planiusculum valde marginatum (marginibus hispidulis) ore brevissime bidentulum subabrupte contracti. *Nux* arcte inclusa, late elliptica, faciebus inaequalibus. *Stylus* basi incrassatus. *Stigmata* 3.

LAOS. Pak Munung, Wieng Chan, in evergreen forest, c. 1200 m., 22 April 1932, *Kerr* 21,202 (Kew).

### XXXVII—NOTES ON CAREX: IX. E. NELMES.

#### SPECIES CONFUSED WITH *C. nivalis* BOOTT.

In the Pflanzenreich, under *Carex nivalis* Boott, Kükenthal placed three forms which seem to me to call for some elucidation.

#### I.

"*C. nivalis* Boott forma 1. *Griffithii* (Boott) Kükenth.—*C. Griffithii* Boott in Trans. Linn. Soc. xx. (1846) 138.—Spicula terminalis mere ♂.—Afghanistan (Griffith n. 78, n.v.). Northwest-himalaya: Gilgit (Giles!)."

Griffith's plant. no. 78, is the type of *C. Griffithii* Boott. If Kükenthal had seen it he would, I feel sure, have decided that it was not so closely related to *C. nivalis*. I agree with Boott and Kreczetowicz that it is a distinct species. Griffith's 142, collected in the same locality, Koh-i-Baba, also belongs to this species.

The other plant cited above, collected by Dr. G. M. J. Giles on the Gilgit Expedition in Kashmir, is described below as a new species.

***Carex Gilesii* Nelmes**, sp. nov.; affinis *C. Griffithii* Boott, sed spicis cylindricis fastigiatis numquam androgynaeceis, squamis brevioribus, utriculis elliptico-obovatis differt.

*Rhizoma* stoloniferum. *Culmi* 50-65 cm. longi, subvalidi, laeves, triquetri, inferne foliati, basi vaginis aphyllis brunneis paucis circumdati. *Folia* e basi culmi aggregatim orta, culmo multo breviora, 4-7 mm. lata, plerumque plana sed interdum conduplicata, rigidiuscula, longe attenuata. *Spicae* 4, superiores 1-2 ceteris breviores et graciliores, semper fere omnino masculae, 1.5-2 cm. longae, ceterae femineae, 2.5-3.5 cm. longae, circiter 5 mm. latae, infima longissime pedunculata, superiores pedunculatae vel sessiles, fastigiatæ, cylindricae, densiflorae, basi graciliores et

sublaxiflorae, cernuae; pedunculis laevibus et filiformibus. *Bracteae* inferiores breviter foliaceae, spicis multo breviores, longivaginant, superiores brevissimae et squamiformes, vix vaginant. *Squamae* anguste oblongae, 3.5–4 mm. longae, acuminatae, brunneo-purpureae, carina pallida excurrente. *Utriculi* plerumque squamis longiores, 4 mm. longi, circiter 2 mm. lati, elliptico-obovati, superne castaneo-purpurei, inferne albidii, papyracei, compressi, enerves, in rostrum breve albidum leviter flexuosum laeve ore leviter bilobum abrupte contracti. *Nux* parvula, stipitata, in utriculi parte inferiore sita. *Stylus* longus. *Stigmata* 3, in utriculo paulum inclusa.

INDIA. Kashmir: Tui Pass, Gilgit, 3600–4200 m., *Giles* 475 (Kew).

## II.

“*C. nivalis* Boott forma 2. *cinnamomea* (Boott) Kükenth.—*C. cinnamomea* Boott in Trans. Linn. Soc. xx. (1846) 136, neque Olney neque Cheesem.—*C. Oliveri* Boeck. in Flora LXIII. (1880) 455.—*Squamae* cum utriculis *cinnamomeae*. *Utriculi* marginibus virentes ore bidentuli.—Afghanistan: Kuram Valley (Aitchison n. 1242!). Karakorum (C. B. Clarke n. 30254!). Westhimalaya: Kashmir (C. B. Clarke n. 29921!); Tibet (Schlagintweit n. 5682!, Thomson!); Gurwhal (Schlagintweit n. 10022!).”

There appear to be several species included in this second of Kükenth’s forms.

1. *C. cinnamomea* Boott was described from a specimen collected by Royle in India, which came to Kew with Boott’s Herbarium. It is, in my opinion, specifically distinct from *C. nivalis*, differing principally in its much smaller and differently shaped utricle.

2. *C. Oliveri* Boeck. was based on Aitchison’s plant (no. 1242) from Afghanistan, and is quite distinct from all its relatives, but is nearer to *C. Griffithii* and *C. Gilesii* than it is to *C. nivalis* and *C. cinnamomea*.

3. Clarke’s no. 30,254 is, I believe, merely a colour form of *C. luteo-brunnea*, a species described below, but the remainder of the plants cited by Kükenth under f. *cinnamomea* seem to belong rather to *C. nivalis* proper.

## III.

“*C. nivalis* Boott forma 3. *luteo-brunnea* Kükenth. form. nov.—*Squamae* cum utriculis *luteo-brunneae*.—Karakorum (C. B. Clarke n. 30,448!) Tibet (Schlagintweit n. 5450!, 6089!).”

Clarke’s 30448 is, in my opinion, specifically distinct from all the other plants cited in this paper, and I describe it below, choosing as the type another number of Clarke’s from the Karakorum (30,235) which is identical with it, but represented by better specimens. Schlagintweit’s numbers appear to belong here, as their spikes are similar in colour to those of the western plant, but their fruits are immature.

**Carex luteo-brunnea** (Kükenth.) *Nelmes*, sp. nov.; affinis *C. Oliveri* Boeck. sed foliis latioribus, squamis marginibus albo-hyalinis, utriculis latioribus in rostrum minus brevius magis abrupte contracti praecipue differt.

*Culmi* 80 cm. alti, subvalidi, inferne laeves, superne scabriusculi, foliati, subrigidi. *Folia* culmo paullo breviora, usque 8 mm. lata, planiuscula, subrigida, longe attenuata. *Spicae* 5, raro 6, superiores 1-3 gynaeandreae, ceterae femineae, fastigiatæ vel infima subdistans, nutantes, 3-5.5 cm. longae, 5-7 mm. diametro, cylindricæ, densifloræ sed basi laxiores, infima basi breviter ramosa, superiores breviter inferiores longe pedunculatæ (pedunculi parce scabri). *Bracteæ* inferiores breviter foliaceæ, spicis multo breviores, vaginantes, superiores squamiformes, evaginantæ. *Squamæ* anguste oblongo-obovatae, 4 mm. longae, luteo-brunneæ, marginibus anguste albo-hyalinæ, apice subacutæ, carinatae, mucronulatæ. *Utriculi* squamis longiores et latiores, 5.5-6 mm. longi, circiter 2.5 mm. lati, elliptico-obovati, papyracei, compressi, inferne albidii, superne luteo-brunneæ, 2-nerves, tenuibus submarginalibus, basi vix stipitati, apice interdum hispiduli, in rostrum brevissimum gracile leviter flexuosum ore albo-hyalinum inaequaliter bilobum abrupte contracti. *Nux* parvula, in utriculi parte inferiore sita. *Stigmata* 3.

INDIA. Karakorum, 4200 m., 9 August 1876, *Clarke* 30,235 (type, Kew); 12 August 1876, *Clarke* 30,448 (Berlin).

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### XXXVIII—NOTES ON CAREX: X. E. NELMES.

#### NEW AUSTRALIAN SPECIES AND RECORDS.

During recent years, through the enthusiastic exertions of Messrs. Raleigh A. Black and S. T. Blake, several interesting *Carices* have been discovered in Australia, some of which are new to science and others hitherto unrecorded for this continent.

Notes on these plants are arranged geographically below.

#### TASMANIA.

Of the twenty *Carices* forming Section 65, *Echinochlaenæ* Th. Holm, in Kükenthal's monograph in *Das Pflanzenreich*, sixteen are endemic to New Zealand, one each to Tasmania and Western Australia, and the remaining two are South American. The Tasmanian plant, which Kükenthal had described five years earlier (*Bull. Herb. Boiss. Sér. 2, 4, 59: 1904*) as *Carex tasmanica*, is, as might be expected, of closer affinity to the New Zealand representatives than are the Western Australian and South American plants. It is worthy of note that no member of this strong New Zealand Section has been recorded from the mainland of Australia, but under Victoria is described what appears to be an interesting link between this Section and a closely related one.

In *Kew Bull. Add. Ser. 8, 83 (1908)*, a Tasmanian sedge was described posthumously by C. B. Clarke as *C. Richmondii* Boott.



Kükenthal's type of *C. tasmanica* has been borrowed from Berlin and compared with Clarke's plant, and in my opinion the two are conspecific. As *C. tasmanica* Kükenth. was described four years earlier than *C. Richmondi* Boott ex C. B. Cl., the latter name falls into synonymy.

*C. tasmanica* was based on two specimens collected by L. Rodway, one on the Derwent River and the other on Mt. Dromedary, and *C. Richmondi* on a gathering of A. F. Oldfield made "on the Coal River" at Richmond, near Hobart, Tasmania.

Mr. Raleigh A. Black has been very energetic, with the help of friends, in trying to rediscover *C. tasmanica* in Tasmania. I consider that his 1160-(1), collected on Mt. Direction in 1911, belongs to this species.

Before leaving Tasmania I have to record another interesting *Carex* received at Kew from Mr. Black, no. 1150-(4), and collected by him at Bellerive, in that island, in December 1917. Its identification has not been precisely determined, but it is either conspecific with our northern *C. divisa* Huds., or very closely akin to it. It differs sufficiently, I consider, from typical *C. divisa* to rule out the possibility of its being an introduction, and Mr. Black tells me that the nature of its habitat tends to confirm this view.

#### VICTORIA.

Both Mr. Black and Mr. Blake have sent interesting *Carices* from Victoria, but this being Mr. Black's State he has had the larger haul.

His most outstanding discovery was collected last year on the road from Mt. Hotham to Omeo. It is evidently related to that rather common Australian sedge, *C. inversa* R. Br., but is at once seen to differ in its chestnut-coloured blunter glumes and much less strongly nerved utricles.

Closer study of this plant showed that it agreed still more nearly with the description under the name "*C. hypandra* F. Muell.", cited from *Fragm.* 8, 259 (1874), on page 190 of Kükenthal's monograph in *Engl. Pflanzenr.* IV. 20 (1909). Kükenthal cites specimens collected in Victoria by Mueller and by Maiden. When the Maiden specimens, determined by Kükenthal as *C. hypandra* Muell., were borrowed from Berlin they were found to have been collected on Mount Kosciusko, New South Wales. They exactly match specimens at Kew, collected by Mueller on Mt. Buller, and in the Moroka Valley, Victoria, which were determined by C. B. Clarke as *C. Colensoi* Boott, a closely related but distinct New Zealand sedge. At an earlier date Mueller had written up the Mt. Buller plants as *C. inversa* var. *alpina*, and Boott the Moroka Valley specimens as *C. hebes*.

Before discussing the true *C. hypandra* Muell. it will be well to define the position of and the relationship between Mr. Black's plant and that described by Kükenthal and erroneously identified

with *C. hypandra*. The two plants are, in my opinion, specifically distinct from each other. The former is described as *C. Raleighi*, in honour of the finder, and to the other is applied the epithet suggested by Boott but apparently never published.

† *Clavis specierum*.

- Culmi 25–40 cm. alti, gracillimi; folia valde canaliculata, circiter 1 mm. lata; spicae 1–3; utriculi 3 mm. longi, 1 mm. lati, dorso tenuiter multinerves, ventre enerves vel obscure paucinerves ..... *Carex Raleighii*  
 Culmi 8–20 cm. alti, subgraciles; folia canaliculata, circiter 2 mm. lata; spicae 3–5; utriculi 3.5 mm. longi, 1.5 mm. lati, dorso obscure nervati ventre enerves..... *Carex hebes*

1. *Carex Raleighii* Nelm., sp. nov.

*Rhizoma* stoloniferum, lignosum, gracile. *Culmi* 25–40 cm. alti, gracillimi, laeves, curvati, basi vaginis aphyllis paucis fuscis circumdati. *Folia* circiter 1 mm. lata, curvata, culmum subaequantia, canaliculatissima, apice attenuata, circinata. *Spicae* 1–3, ellipsoideae, 5–9 mm. longae, gynaeandreae, densiflorae, in capitulum oblongum congestae, infima longibracteata. *Squamae* ovatae, subacutae, fusco-castaneae, marginibus albo-hyalinae, pallide carinatae. *Utriculi* ovato-lanceolati, circiter 3 mm. longi, 1 mm. lati, plano-convexi, membranacei, squamas aequantes, glabri, demum subpatentes, dorso tenuiter plurinerves, ventre enerves vel obscure paucinerves, substipitati, marginati, superne anguste alati hispiduli, in rostrum mediocre antice sulcatum latiusculum ore albidohyalinum oblique sectum bidentulum sensim attenuati. *Stigmata* 2.

VICTORIA: Bogong County; Mt. Hotham–Omeo Road, 1800 m., 30 January 1938, *Raleigh A. Black* 1150-000–(7) (Kew).

2. *Carex hebes* Nelm., sp. nov.

*Rhizoma* breviter stoloniferum, lignosum. *Culmi* 8–20 cm. alti, subgraciles, laeves, curvati, basi vaginis aphyllis paucis brunneis circumdati. *Folia* circiter 2 mm. lata, rigida, curvata, culmo longiora vel breviora, canaliculata. *Spicae* 3–5, ellipsoideae, 5–10 mm. longae, gynaeandreae, densiflorae, in capitulum oblongum congestae, bracteatae, bractea infima saepe subfoliacea. *Squamae* ovatae, acutae vel subacutae, castaneae, marginibus late albo-hyalinae, late viridi-carinatae, saepe breviter mucronulatae. *Utriculi* ovato-elliptici, circiter 3.5 mm. longi, 1.5 mm. lati, plano-convexi, membranacei, squamas aequantes vel paullo superantes, glabri, suberecti, utrinque enerves vel dorso obscure nervati, substipitati, marginati, superne anguste alati hispiduli, in rostrum mediocre latiusculum ferrugineum ore albidohyalinum oblique sectum bidentulum sensim attenuati. *Stigmata* 2.

VICTORIA: Wonnangatta County; Mt. Buller, *Mueller* (type, Kew); Valley of the Maroka [Moroka], 1200 m. (Kew).

NEW SOUTH WALES: Wallace County; Mt. Kosciusko, 1800–2100 m., Jan. 1899, *Maiden* (Berlin).

Kükenthal apparently never saw the real *C. hypandra* F. v. Muell., which is represented at Kew by one good fruiting specimen.

In his *Fragmenta*, as cited above, Mueller mentioned this *Carex* as being very near to *C. bicolor* All., a native of northern Europe. He added that if it eventually proved to be distinct it could be called *C. hypandra*. This is a “nomen provisorium,” and as the plant was described under this name by Bentham in *Fl. Austral.* 7, 439 (1878), the correct citation is *Carex hypandra* F. Muell. ex Benth.

This species is in fact very distinct from *C. bicolor* and its two northern allies, *C. rufina* Drejer and *C. eleusinoides* Turcz., though it agrees with them in having a gynaeandrous terminal spike and in being distigmatic. This form of terminal spike is common in high altitudes. I consider that *C. hypandra* has a closer affinity with *C. Gaudichaudiana*, the Australian relative of the common European sedge *C. Goodenowii* Gay.

We now come to the Victorian *Carex* mentioned earlier as perhaps an interesting link between the New Zealand Section *Echinochlaenae* Th. Holm and that placed next but one before it by Kükenthal, *Spirostachyae* Drejer. The Australian representative of this Section is *C. Gunniana* Boott (closely related to our well known northern *C. distans* L.).

I had long suspected that the Victorian material of “*C. Gunniana*” in the Kew Herbarium was specifically distinct from the Tasmanian, and the receipt at Kew of good specimens of the former plant from Mr. Blake confirmed my suspicions. A printed copy of Boott’s description of *C. Gunniana* (*Trans. Linn. Soc.* 20, 143: 1846) is pasted down on a sheet of each of these two species, and Kükenthal (following Boott and Clarke) also considers that only one species is represented as he cites specimens from both Tasmania and Victoria. Boott described *C. Gunniana* from Tasmanian material collected by R. C. Gunn (no. 578), and I therefore separate the Victorian plant from it and describe it below. As will be noted it is considered to stand nearer to *C. tasmanica* Kükenth. than to *C. Gunniana* Boott, though it has some affinity with the latter species.

***Carex Blakei* Nelmes**, sp. nov.; affinis *C. tasmanicae* Kükenth., sed foliis planis latioribus, utriculis majoribus membranaceis minus nervatis dentibus strictis praecipue differt.

*Rhizoma* caespitosum. *Culmi* 30–40 cm. alti, subvalidi, obtuse triquetri, laeves, usque ad basin vaginis aphyllis atro-purpureis obtecti. *Folia* culmo plerumque breviora, 4.5–7 mm. lata, plana, rigida, coriacea, superne scabrida. *Spicae* 3–5, suprema mascula, pedunculata, lineari-cylindrica, 2.5–3 cm. longa, laterales femineae, oblongo-cylindricae, 1.5–2.5 cm. longae, crassae, densiflorae, superiores subapproximatae, subsessiles vel breviter pedunculatae, inferiores saepe remotae et pedunculatae interdum longissime pedunculatae.

*Bracteae* foliaceae, omnes culmum superantes, superiores vix inferiores longe vaginantes. *Squamae* late ovatae, apice obtusae interdum excisae, marginibus anguste albo-hyalinae, e dorso viridi trinervi carinatae, mucronatae. *Utriculi* plerumque squamas superantes, 3·5–4 mm. longi, late elliptici, subpatentes, trigoni, pallide virides, glabri; utrinque tenuissime plurinerves, in rostrum planiusculum latiusculum mediocre marginibus scabrum ore bidentatum (dentibus strictis) subsensim desinentes. *Nux* arcte inclusa, obovata, conspicue trigona, rostrata. *Stigmata* 3.

VICTORIA: Delatite County; Mt. Buffalo, in morasses at about 1350 m., 25 January 1935, *Blake* 7366 (type, Kew), 7368; Mt. Buffalo, edge of Lake Catani, 29 January 1938, *R. A. Black* 1163-004-(2) (Kew).

NEW SOUTH WALES: Selwyn-Wallace Counties; Munyang Mountains, 1877, *Mueller* (Kew).

#### QUEENSLAND.

The recent additions to the *Carex* flora of this State, though involving only one certain new species, are nevertheless of considerable interest. They are due almost entirely to the activities of Mr. S. T. Blake.

One of his new records for the Australian continent is a fairly typical specimen of *C. cryptostachys* Brongn., collected by him (no. 9757 A) on 2 October, 1935, in rain-forest at 200–300 ft. on Mt. Bartle Frere, Cook District, Queensland. This species has its centre of distribution in Malaya, and had not hitherto been found south of Java.

A second *Carex* recorded for the first time from Queensland is even more interesting. This plant belongs to a little known group of species which Ohwi, a Japanese authority, has designated the *Lageniformes*, from the unusual shape of the utricle. Blake collected this plant (no. 9757) with the other on Mt. Bartle Frere. It is perhaps conspecific with *C. breviscapa* C. B. Clarke, a Ceylon plant, *Thwaites* 3781, the only specimen recorded under the name. *C. lutchuensis* Ohwi (Mem. Coll. Sci. Kyoto Imp. Univ. ser. B, **5**, 270: 1930), cited by Ohwi from Formosa and the Riukiu Islands, may also be the same species, judging from his description and the accompanying illustrations. Ridley's *C. Curtisii*, too, from the island of Penang, is extremely closely related.

Lastly, a new species of the Subgenus *Indocarex* Baill., has been collected by Mr. H. Flecker, of Cairns, at Campbell's Creek in north Queensland. *Indocarex*, which bears its spikes in panicles and is confined to the tropics, had hitherto been represented in Australia by only two recorded species, *C. Dietrichiae* Boeck., which has a near affinity with *C. indica* L., and, according to Kükenthal, *C. Rafflesiana* Boott, collected by St. Johnson on Mt. Bartle Frere. A description of the new species follows.



**Carex Fleckeri** *Nelmes*, sp. nov., affinis *C. Dietrichiae* Boeck., sed foliis latioribus haud coriaceis, paniculis laxioribus, utriculis distincte trigonis ellipticis curvatis differt.

*Rhizoma* caespitosum, validum, lignosum. *Culmi* 80–90 cm. alti, subvalidi, inferne foliati, angulis scabriusculi. *Folia* 13–17 mm. lata, plana, haud coriacea, culmum subaequantia. *Inflorescentia* paniculata, interrupta. *Paniculae secundariae* circiter 6, oblongo-pyramidales, laxae, distantes, plerumque longe exserte pedunculatae; pedunculi scabriusculi. *Rhachis* hispida. *Bracteae* foliaceae, inflorescentiam longe superantes, suprema excepta longivaginantia. *Spicae* androgynaeceae (pars mascula parti femineae aequilonga), 1–1.5 cm. longae, demum divaricatae; bracteola squamiformis, longiaristata. *Squamae* albae, oblongae, longe aristatae; arista recurva. *Utriculi* 4.5 mm. longi, plerumque squamas subaequantes, distincte trigoni, elliptici, glabri, olivacei, subdivaricati, curvati, utrinque plurinerves, apice in rostrum longum conicum oblique sectum subabrupte contracti. *Stigmata* 3.

QUEENSLAND: Cook District; Campbell's Creek, near Cairns, crevices of rocky banks, 27 October 1935, *Flecker* 923 (Kew.)

### XXXIX—MISCELLANEOUS NOTES.

**The Assistant for India.**—The Government of India has selected Mr. K. N. KAUL, M.Sc., Demonstrator in Botany at the University of Lucknow, for appointment to the post of Assistant for India at the Royal Botanic Gardens, Kew. Mr. Kaul commenced work at Kew on July 1st. The appointment will take effect from January 1st, 1940, and until then Mr. C. E. C. FISCHER will continue to hold the post of Assistant for India, when he will be succeeded by Mr. Kaul.

**Mr. C. V. B. Marquand.**—Owing to continued ill-health, Mr. C. V. B. MARQUAND resigned his position as Botanist in the Herbarium on May 31st, 1939. Mr. Marquand was appointed in March 1923 and had charge of the Chinese Department and of the *Bryophyta* and *Charophyta*. He had specialized for some years on the genus *Gentiana*, and most of his published work has been on this genus.

**Mr. A. A. Bullock.**—Mr. A. A. BULLOCK, B.Sc., Assistant Botanist in the Herbarium, has been appointed by the Minister of Agriculture and Fisheries to the post of Botanist as from June 1st, 1939.

**ALBERT MORRIS.**—By the death of Mr. Albert Morris at Broken Hill, New South Wales, on January 9th, 1939, Australia has lost one of its keenest students of the botany of the interior of New South Wales and adjacent territories. He was born at Bridgewater, South Australia, on August 13th, 1886. He collected an herbarium

of over 5000 sheets mainly devoted to inland Australia and rich in *Acacia*, *Eucalyptus* and *Chenopodiaceae*. It is now held by the Zinc Corporation, a public company by whom he was employed and which has done much to encourage scientific endeavour in Broken Hill and district. Duplicates from his herbarium are well-represented at Sydney and Brisbane, and to a less extent in this country and abroad. He was always willing to assist botanists in other parts of the world with material and his specimens are frequently seen quoted in modern monographs dealing with Australian xerophytic families. He was keenly interested in the cultivation of native plants and was largely responsible for extensive planting operations about Broken Hill and Silverton. His wife helped him considerably with all this work and it is pleasing to know that the Zinc Corporation have arranged for her to carry it on. What pleased Morris most, perhaps, was the establishment of a regeneration area protected from stock and rabbits. Mrs. Morris writes that it is regrettable he did not live to see the results a good season would yield—after only two years *Acacias*, *Cassias*, *Chianthus*, *Epacrids*, *Dodonaeas* and grasses have come back, and the area has responded remarkably well.

C. T. WHITE.

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**South African Forestry Association.**—This Society has now started a Journal,\* the first number of which appeared in October last. It will be published twice annually, and will contain general articles and research papers on forestry and allied subjects and will also serve for the exchange of views on all matters of interest to members. All articles will be published in the journal in the language in which they are submitted, though readers outside South Africa would no doubt much appreciate that important papers in Afrikaans should include a short summary in English.

From a very interesting historical sketch of the development of forestry in South Africa we learn that the forestry department dates from 1847, when a conservator and four rangers were appointed to prevent further destruction, which had been going on since the first settlers landed in 1652. Up to 1872 all that was attempted was control of the existing forests, and it was not until J. Storr Lister, of the Indian Forest Service, was appointed in 1875, that plantations were started to supplement the meagre natural timber resources of the country. It is interesting to learn that the first seeds of *Pinus insignis*, a tree now of major importance in the western and south western districts, were obtained in the Botanic Garden at Cape Town. Lister was also responsible for the successful reclamation of the sandy Cape Flats on which he sowed seeds of the Australian *Acacias*, *A. cyclopis* and *A. saligna*, converting barren waste land which now yields a steady revenue from the sale of fuel, besides reducing sand drift.

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\* Journal of the South African Forestry Association, No. 1, October 1938 (Pretoria, Published by the Association ; price to non members 6s. net).



The late Sir David Hutchins, also of the Indian Forest Service, joined the Cape Forest Service in 1882, and vigorously tackled many problems needing attention. He it was who recommended the introduction of Mexican pines for the high veld of the Transvaal, and seeds of various species were tried, of which *Pinus patula* is a notable example and has become of major importance in the summer rainfall areas.

Several members of the forestry department since its inception made valuable collections for the Kew Herbarium, particularly Dr. Pappe, Dr. Fourcade, and Mr. Legat.

It is interesting to learn which of the many exotic trees tried have been the most suitable for South African forestry. The main coniferous trees now used are, in the Western Cape Province, *Pinus insignis*, *P. pinaster* and *P. canariensis*; in the Southern Cape Province, the same with the addition of *P. caribaea*; in the Eastern Cape Province, the same species and *P. patula*, *P. longifolia* and *P. taeda*; in the Transkei, *P. patula*, *P. longifolia*, *P. caribaea*, *P. canariensis* and *P. taeda*; and in Natal, Zululand, and the Transvaal, *P. patula*, *P. longifolia*, *P. caribaea*, *P. taeda* and *P. palustris*.

Hardwoods are represented by 50,220 acres of *Eucalyptus*, 25,378 acres of *Acacia cyclopis* and *A. saligna*, used as stated above for drift sand reclamation; 12,809 acres of tan wattles (*Acacia mollissima* and *A. decurrens*); and the balance of other species of trees.

It is satisfactory to note that "conservation in its widest sense has always been the key note of the forest service," and that long before the public began to take an interest in the preservation of the flora the forest service was doing so in an unobtrusive way by creating nature reserves in which no cutting of wood, gathering of flowers or shooting is permitted.

This historical sketch concludes with an appreciation of tree planting by private individuals. Simon van der Stel, first Governor of the Cape, was responsible for the planting of oaks which contribute so largely to the charm of many old homesteads in the Cape. Particularly mentioned are the gardens of the late Mr. Arderne at Claremont, and Cecil Rhodes at Groot Schuur, the latter now the official residence of the Prime Minister of the Union. In Natal an outstanding example is the estate called Benvie at Karkloof, to which the late Mr. Geike retired about 1870 and devoted himself to gardening and tree planting. Here may be seen rhododendrons and azaleas second to none in South Africa, and a wealth of trees from many parts of the world.

Other interesting papers on forestry matters make up the 66 pages of the first part of this Journal, which should fill an important rôle in South Africa.

J. HUTCHINSON.

**Spore Discharge in Land Plants.\***—In a short introductory chapter Dr. Ingold tells us that his interest in the subject of spore liberation and dispersal was first aroused through reading the first two volumes of Buller's "Researches on Fungi." Since then he has devoted considerable attention to observation of the various methods of violent spore discharge which are found in cryptogams, and this little book is an admirable epitome of present knowledge. The facts described are classified according to the type of mechanism involved, as water-squirting mechanisms, discharge due to the rounding-off of turgid cells, the drop-excretion mechanism of the *Basidiomycetes*, catapults, air-guns, hygroscopic and spiral-spring mechanisms, and so on. While the greater part of the work is concerned with *Fungi*, in which so many and varied types of spore-discharge occur, the *Pteridophyta* and *Bryophyta* are dealt with in chapters 7 to 10. The work of previous investigators is clearly summarised and correlated, but the whole is made alive by Dr. Ingold's own observations and comments, and by the very clear and beautiful illustrations from his own drawings. The final chapter summarises briefly the general problems of spore dispersal in land cryptogams, and at the end there is an appendix giving a classification of the seedless plants and notes as to the occurrence of violent spore-discharge observed in each group. The book is completed by a bibliography of over 60 titles.

Dr. Ingold is to be congratulated on having produced a most readable and stimulating account of the processes of spore-discharge, which will be invaluable to students and to all nature lovers. One leaves it with the impression that he has enjoyed writing it. The book should do much to bring about response to his plea that in University botanical courses "opportunity should be taken to study the organism in action rather than to concentrate on mangled corpses which have lain for years in pickle." "In the *Fungi* some of the time that is so often spent on the subject of sex, especially in *Ascomycetes*, might more profitably be spent in the study of spore discharge and spore dispersal."

E. M. WAKEFIELD.

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\* By C. T. Ingold. Oxford, The Clarendon Press, 1939. Pp. vi.+178, 75 text figures. Price 7s. 6d.

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Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE  
By the South Essex Recorders, Ltd., Ilford.

(1528) Wt. 18/82 800 8/39 S.E.R. Ltd. Gp. 381